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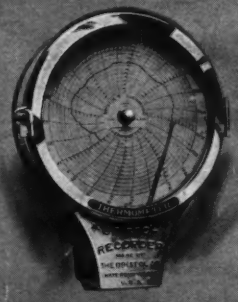

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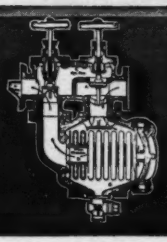

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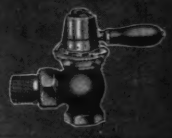

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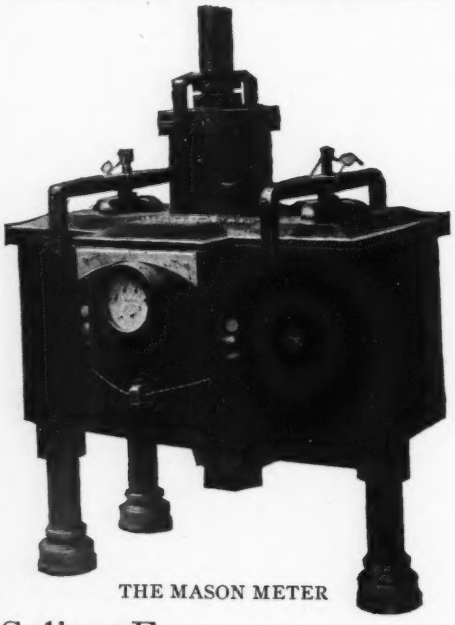

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THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK SEPTEMBER, 1916

New York School Heating Practice

With Special Reference to New York City Public School Buildings

By FRANK G. McCANN.*

(From a paper read before the Municipal Engineers of New York City.)

The city of New York has a school population of over 690,000 children, a population greater than the entire population of any other city in the United States, aside from Chicago and Philadelphia. The school registry of the city of New York exceeds the combined school registry of the next five largest cities of the United States.

Again, the amount of coal burned per annum for one school may seem small and not important, being only from about 10 tons for a one-room portable school up to 1,500 tons for the largest high school, but it is hard to realize that the total annual coal bill for all public schools of this city amounted to about $600,000, as shown in Fig. 1; a goodly sum and one worthy of vast thought and study looking to its reduction to the lowest limit compatible with the health of the pupils and the dictates of efficiency.

Out of nearly 700 buildings, most of them are more or less obsolete, and it is difficult to conceive of any type of heating or ventilating system that is not or has not been found in some one of these buildings.

Even now it is difficult to obtain adequate funds to provide proper equipment or to have the excellent modern equipments with which the more recent buildings are provided, adequately operated; the State law requiring adequate ventilation of school rooms, etc., does not apply to this city.

PRESENT METHODS OF DESIGN.

When a new school is contemplated, the board of superintendents select a locality where, in its judgment, based upon school census, etc., an additional school is needed, and what number of rooms, etc., such building should have.

Upon receipt of such data, estimates of costs for the different features entering into the building are made up and money is asked from the Board of Estimate for such building. If the desired

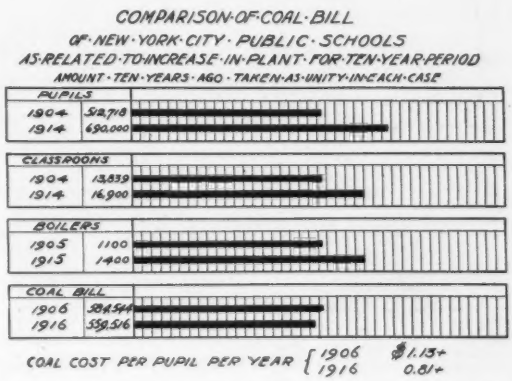


FIG. 1.—COMPARATIVE INCREASE IN FUEL CONSUMPTION IN NEW YORK CITY PUBLIC SCHOOLS.

*Chief of Heating and Ventilating Division, Board of Education New York City.

money or any part thereof is granted, sketches for the new building, on the basis of the available funds, are prepared and considered by the Board of Education; when sketches have been approved by them, the contract drawings are proceeded with.

The heating and ventilating work is sketched out during the progress of the general construction drawings, so that flues, boiler-plant, etc., may have space alloted and provided under the construction contract.

Since the funds are never copious, there have, of course, to be many compromises in order to get all the classroom facilities, etc., deemed necessary and still keep within the appropriations.

Notwithstanding the above, the heating and ventilating installations of the more recent public schools have been pronounced by various trustworthy and unbiased authorities to be among the best in the world.

HEATING.

In the majority of the newer buildings the heating is accompished by means of cast-iron radiators of the type commonly used in offces and apartments, placed exposed in the rooms directy underneath the windows.

The heating surface or heating effect of such radiators is so calculated as to provide sufficient heat to warm the respective rooms from zero to 70° F. within a period of about four hours and is, therefore, more than sufficient to maintain the rooms at 70° F. in zero weather.

For economy of coal and labor, especially where forced draft is used in the boilers, the boilers are shut off from the heating system as soon as the school session ends for the day, and the fires are cleaned and banked, ready for quick starting up the next morning.

The building, therefore, becames very cold during the night in severely cold weather and especially when high winds accompany low temperatures. (In cases of winds as high as 70 miles an hour and nearly zero temperature, it has been necessary for the janitors to keep up some steam all night to prevent freezing of plumbing fixtures, but this is rare in New York City.)

An excess of heating surface over what is necessary merely to maintain the desired temperature of 70° F. is also necessary because of the long periods of non-occupancy of the building, such as during the Christmas-New Year's vacation, etc., when it would not pay to keep the building heated more than is necessary to prevent freezing of the plumbing fixtures; in fact, one winter when coal was hard to get, the plumbing fixtures were drained and no fires were kept at all during the Christmas vacation period.

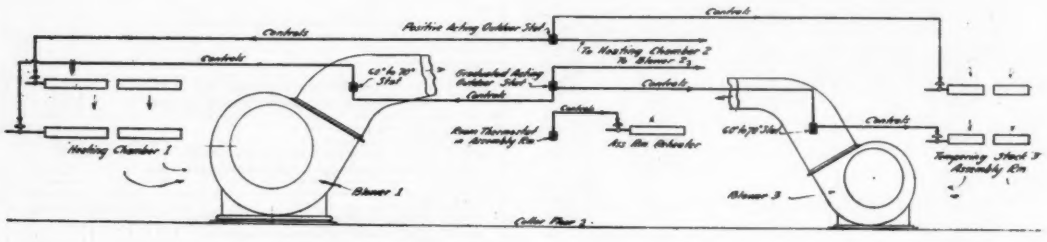
ARRANGEMENT OF AUTOMATIC HEAT CONTROL.

With this excess radiation, it would be difficult to prevent overheating, especially in mild weather, unless some means of automatic control were provided.

This phase of the problem is cared for in three ways:

1. By installing a system of automatic heat regulation local to each room;

2. By automatically controlling the temperature of the fresh air supplied to the rooms for ventilation; and



Diagramatic Sketch showing Thermostatic Control on Indirect Radiation
No Scale

FIG. 3—THERMO CONTROL OF INDIRECT RADIATION.

3. By hand-operated pneumatic control of steam-risers, whereby the number of risers and hence of radiators, may be reduced roughly in proportion to the outdoor atmospheric conditions.

The temperature of the fresh-air supply to the class-rooms, etc., is automatically controlled by a thermostat placed in the trunk duct near the plenum blower discharge as shown in Fig. 2, and to facilitate stabilizing of room temperatures, the functioning point of such duct thermostat is automatically determined by means of a special graduated-acting

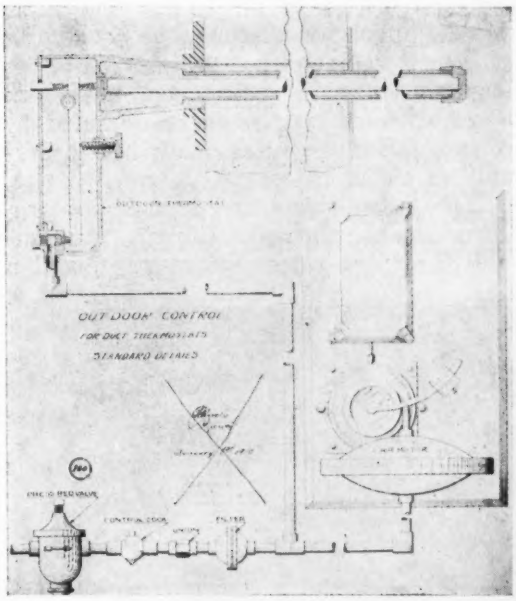


FIG. 3—OUTDOOR CONTROL FOR DUCT THERMOSTATS.

thermostat, shown in Fig 3, placed out-of-doors, which special thermostat automatically adjusts the regulating screw of the duct thermostat so that when the temperature out-of-doors is zero F. or thereabout, the duct thermostat maintains the fresh-air supply at about 72° F., whereas when the outdoor temperature rises to about 40° F., the duct thermostat is automatically set to maintain the fresh-air supply at about 65° F.

By this means the rooms receive cool refreshing air when there is a tendency for them to become overwarm but are supplied with warm non-chilling air when severe cold weather out-of-doors

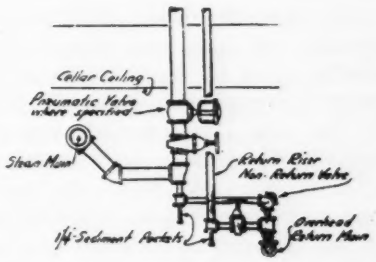


FIG. 4—RISER CONTROL VALVES, PUBLIC SCHOOL 50, BROOKLYN.

renders the occupants susceptible to draftiness or cool breezes.

For the riser-control system, a diaphragm pneumatic valve is inserted in each steam riser, shown in Fig. 4, and a ¼-in. air-line is run from each such valve independently or in groups of several risers passing through rooms having the same exposure, to a three-way cock mounted on a neat board at a location convenient to the janitor, shown in Fig. 5.

Also the radiating surface in each class-room is divided into two or more units, each served by a separate riser.

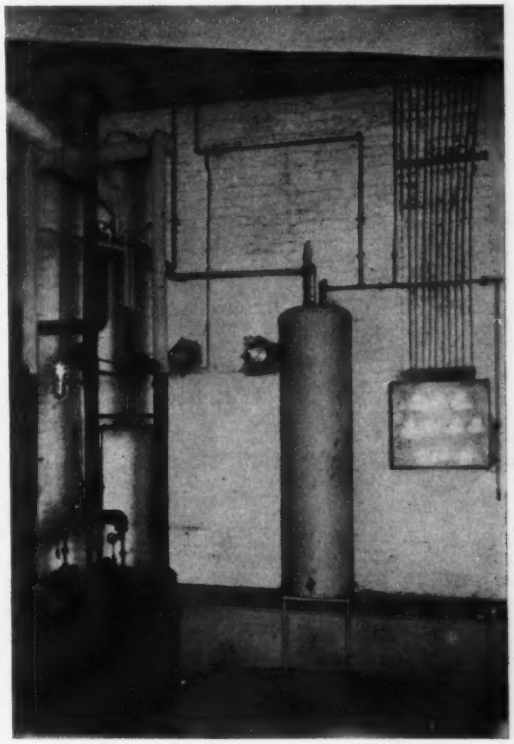


FIG. 5—AIR COMPRESSOR, RISER CONTROLS, ETC., PUBLIC SCHOOL 50, BROOKLYN.

This obviates the possibility of all heat being shut off from any room or tier of rooms in case of a broken or leaking radiator or riser, and, in conjunction with the above-mentioned rise-control system, this enables the attendant to close off about one-half the radiating surface when the temperature out-of-doors or the direct heat of the sun in rooms on sunny side of the building renders a reduction of heating surface advisable or desirable.

Fig. 5 shows the riser-control board, the air-supply for which is taken from the pressure tank of the temperature-regulating system adjoining same.

In order to avoid overheating the pupils seated near to the direct radiators in class-rooms, sheet-metal shades are placed in front of such radiators, serving to reflect the radiant heat and to form flues in which the room air may be heated by such radiant heat and carry same to the room by convection currents. These shields are securely supported 2 in. away from the radiator by means of cast-iron separators and stove bolts, each run through a washer, the shield and separator and tapped into a boss provided for this purpose in radiator edge on end and occasional intermediate sections.

VACUUM SYSTEM.

All radiators are connected to steam and return risers and have hand-valves in steam-supply, in addition to pneumatic valves, only where not connected to risers having riser control or in case there are special reasons of frequent non-use of room, etc., to necessitate hand-control for the sake of economy.

Every radiator has a non-return or vacuum-valve in connection to return riser, of such type as to be operated by accumulation of water or air but to permit no steam to escape.

The steam-risers are dripped into return mains through similar vacuum-valves or equivalent steam-traps, and a

FIG. 6—TYPICAL OPEN-AIR CLASSROOM, PUBLIC SCHOOL 50, BROOKLYN.

dirt pocket is formed underneath each such drip to catch sediment from riser and prevent choking of trap, as shown in Fig. 4.

A vacuum of about 5-in., mercury gauge, is ordinarily maintained on the return lines, by means of simplex vacuum-pumps, steam or electrically-driven according to circumstances. The vacuum-pumps are, however, capable of maintaining a much higher vacuum and as high as 14 in. is used when starting up from cold building. These pumps draw from a submerged header.

The tightness of the return lines is assured by a test of all such lines under an air-pressure of 30 lbs., which will show up leaks in lines that have seemed perfectly tight under a cold-water test at 100 lbs. pressure.

The vacuum-pumps deliver the condensation from the heating system into an open receiving tank, with a large vapor pipe taken from the highest point of pump discharge, just above top of tank, to atmosphere. To conserve the vapor in this condensation, the make-up water for boiler-feeding is fed into the above tank through the vapor pipe, thereby acting as a jet condenser.

VENTILATION.

There is much skepticism in the daily press and even among the medical profession as to the value of or necessity for mechanical ventilation in schoolrooms, and great claims have been made for so-called open-air or outdoor classes. (Fig. 6.) Excellent showings have been made in such open-air classes, but it is hard to determine what portion, if any, of the benefit to the pupils is due to open air as differentiated from the effects due to special clothing, special food, small classes, special teachers, etc., accompanying such open-air treatment. The fact that the teacher of an open-air class, in addition to having a smaller class, also gets $100 per annum more salary than when teaching a normal class may also be persumed to have some slight tendency to make such classes popular with the teachers.

Owing to the uncontrollable loss of heat through the wide-open windows of an open-air class-room, it is quite evident that there will be more coal required to heat such a room than for a closed room with mechanical ventilation supplying controlled volumes of warmed air for ventilation.

This matter of what constitutes good, adequate ventilation, and the best means to obtain same, has for years past been a bone of contention among engineers, medical men and others and the end is not yet.

In the meantime the new buildings are being equipped with mechanical ventilation, adequate to supply every pupil with at least 30 cu. ft. of fresh warmed and humidified air, taken from as clean a source as practicable, and maintaining comfortable range of tempeartures without noticeable draftiness in the rooms, and such conditions are found generally quite satisfactory to the pupils and teachers.

Of course, not every installation gives entire satisfaction to the occupants, partly because some janitors are unable or unwilling to properly maintain and operate the ventilating systems, and partly because many teachers, used to open windows in the older unventilated schools, refuse to co-operate in the use of the mechanical ventilation systems, claiming that they cannot endure the "canned" or "cooked" air, and failing to realize that nothing detrimental has been added to the air and, so far as chemical or physical analysis has been able to show, nothing whatever (except a little dust) has been taken from the air by its passage through the heaters, blower and duct-work in its passage from out-of-doors to the class-room.

VENTILATION APPARATUS.

For ventilating schoolrooms out-of-door air is ordinarily drawn into a vertical downtake, lined with enameled brick, from an inlet placed at about mid-height of the building as shown in Fig. 7, equally remote from the dust of the streets and from the gases and odors issuing from the smoke-stack, toilet vents and the exhausters drawing out the vitiated or used air from vent flues.

The "selected" air is drawn through steam-heated cast-iron indirect heaters painted on all surfaces and spaced so far apart that dust cannot accumulate there-

on. These heaters warm the air to a temperature not exceeding 72° F., so cannot be said to "cook" or overheat it, especially as the air is only momentarily in contact with such heated surface, being drawn over same at a velocity of 800 to 1,200 ft. per minute.

Clean, fresh water is then evaporated into this air in such quantity as to bring the warmed air up to proper relative humidity, which varies with the outdoor temperature.

The warmed and humidified air is then drawn into a steel-plate blower or ventilating fan, shown in Fig. 8, which thoroughly mixes the air and forces it through sheet-metal ducts and flues, etc., into the class-rooms.

The temperature of this fresh air for ventilation is automatically controlled as hereinbefore described, the humidity is similarly controlled, and the resulting temperature and humidity are such as to maintain in the class-rooms as nearly as possible that balmy feeling which has led the poet to chant "O! what is so rare as a day in June!"

This warmed and humidified fresh air is delivered into the class-rooms through two or more inlet openings, with wire screens inserted in same, mostly for appearance sake. These fresh-air inlets in

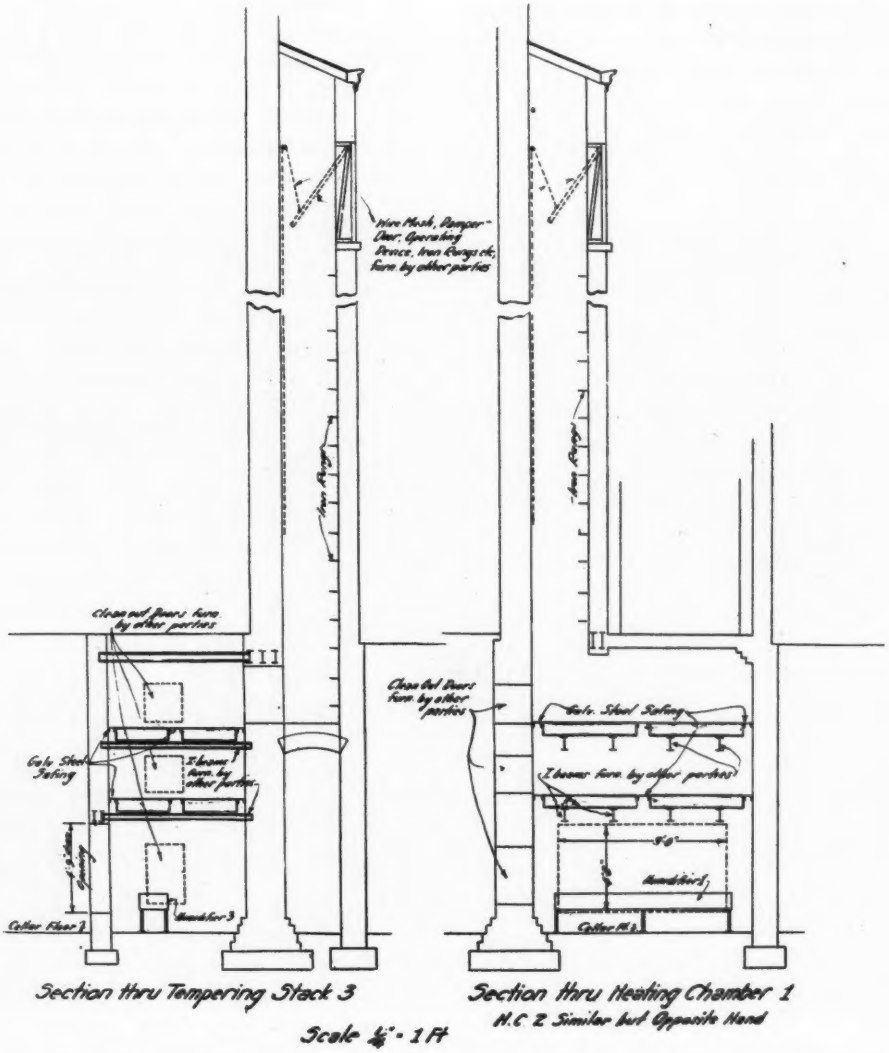


FIG. 7—FRESH AIR INTAKE, PUBLIC SCHOOL 62, MANHATTAN.

rooms are always placed about 8 in. below ceiling on an inside wall on opposite side of room from outside windows.

The rate of velocity of flow through such fresh-air inlets averages only between 240 and 275 ft. per minute and the flow is so diffused that the velocity is nearly uniform through all points of the opening. There is, therefore, no tendency to draftiness.

The spent or used air leaves the room through the lower panels of wardrobe partition on same side of the room as fresh-air inlets and extending across nearly the whole width of the seated portion of the room.

The incoming velocity is adequate to force most of the air across the room before it drops to the breathing plane, where it recrosses the room toward the vent outlets driving the used or so-called "vitiated" air into the wardrobe, and then out of the wardrobe through vent outlet in end or top of wardrobe into vent flue leading to roof.

Thermometer tests of rooms with mechanical ventilating system in service, and out of service, have shown that when the plenum system is in service there is not more than one or two degrees difference in temperature in any two points in the occupied space in room from floor to above the head level, whereas in room when ventilated by opening windows there is often as much as 10° difference between points in the same plane (the so-called breathing plane at or near pupils' heads) and there is much more difference between floor and head-height plane.

From this test, and also from CO_2 tests, flash-powder tests, etc., it is evident that with mechanical ventilation all parts of the room get an even supply of fresh air, whereas with open-air ventilation there is no such regularity, to say nothing of the draftiness in case of high winds and of the entire absence of air-movement in muggy or still-air conditions out-of-doors.

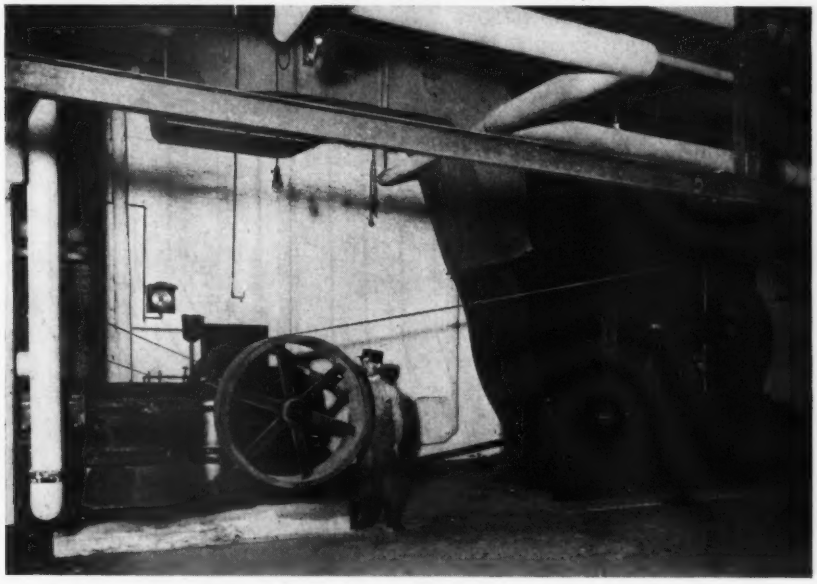


FIG. 8—ENGINE, BLOWER, ETC., PUBLIC SCHOOL 62, MANHATTAN.

In passing through the wardrobes, the spent or used air aerates the outer wraps stored therein and in rainy weather such air dries and deoderizes the wet wraps, thereby serving a needed purifying service. Some may say that the clothing may thus become impregnated with disease germs which have been given off by the pupils, but expert tests have fully demonstrated that such disease germs are not at all likely to be caught by clothing or persons at any considerable distance from the carrier of such germs, and the clothing is much less likely to catch such germs than are the pupils themselves, since the pupils

come into direct personal contact with the sick persons.

The vent outlet in end of each wardrobe is made very large so that it cannot be blocked by the hanging of clothing near to or in front of same. The vent flue from each room is extended up separately, as shown in Fig. 9, to the underside of the roof, and directly beneath roof all such vent flues are gathered together into trunk ducts leading to exhaust-fans, as shown in Fig. 10, one for the same rooms as are supplied by a plenum blower, excepting that the vent flues from toilets are connected to separate exhaust-fans, independent of the class-room vents.

The fresh-air supply to toilets is first delivered into corridors and passes out of corridors into toilet rooms through louvres in toilet room doors. The flow of air is therefore always from corridors into toilet and toilet odors cannot escape into corridors or class-rooms.

The vent outlets from toilet rooms are installed near floor, at points closely at rear of each toilet seat, thus removing all odors at the source before they have a chance to be disseminated throughout the room, and the use of an independent exhaust fan for toilet vents permits the thorough ventilation of such rooms at all times whether mechanical ventilation is being provided for the rest of the building or not.

The exhaust or vent fans are installed in pent houses above the roof of building and discharge through suitable ventilator heads as shown in Fig. 10. Such vent fans are electrically driven, since they are too remote from boilers to warrant the use of steam-engines for this purpose.

In smaller buildings exhaust fans are

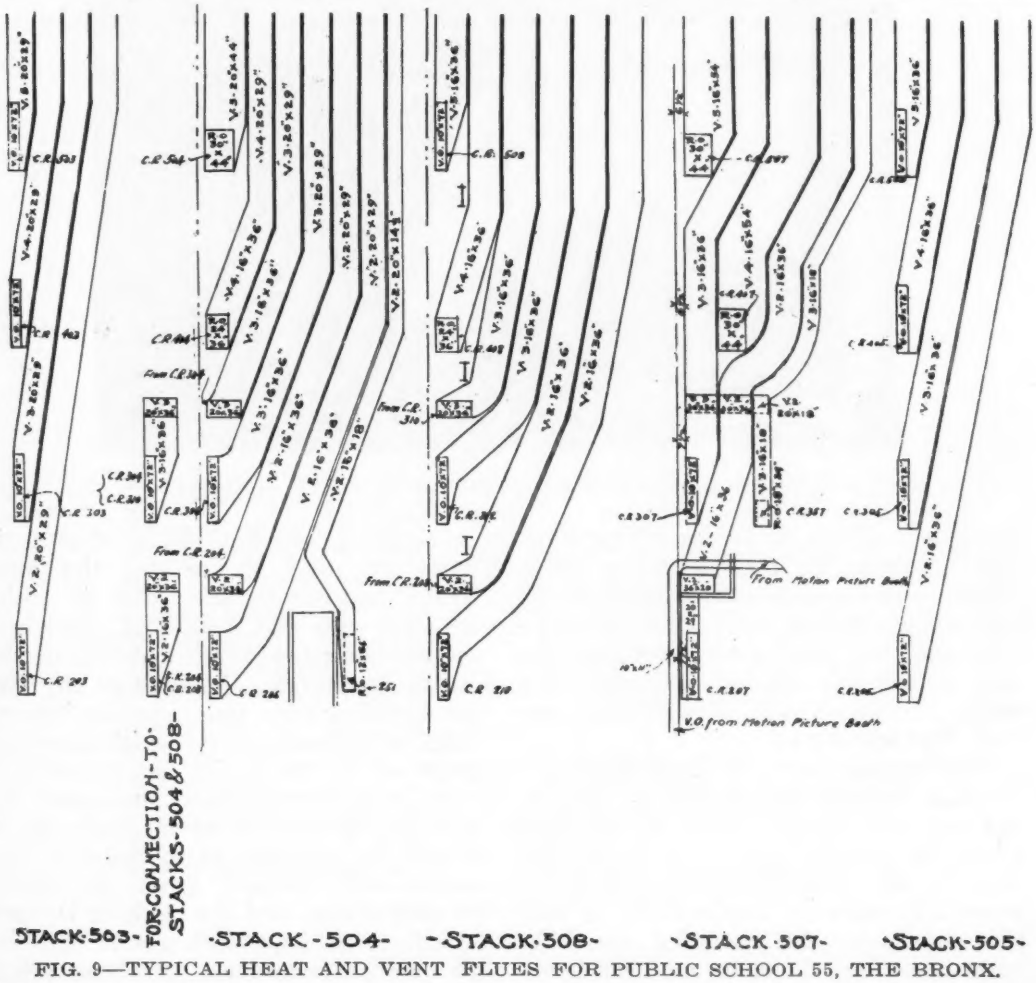


FIG. 9—TYPICAL HEAT AND VENT FLUES FOR PUBLIC SCHOOL 55, THE BRONX.

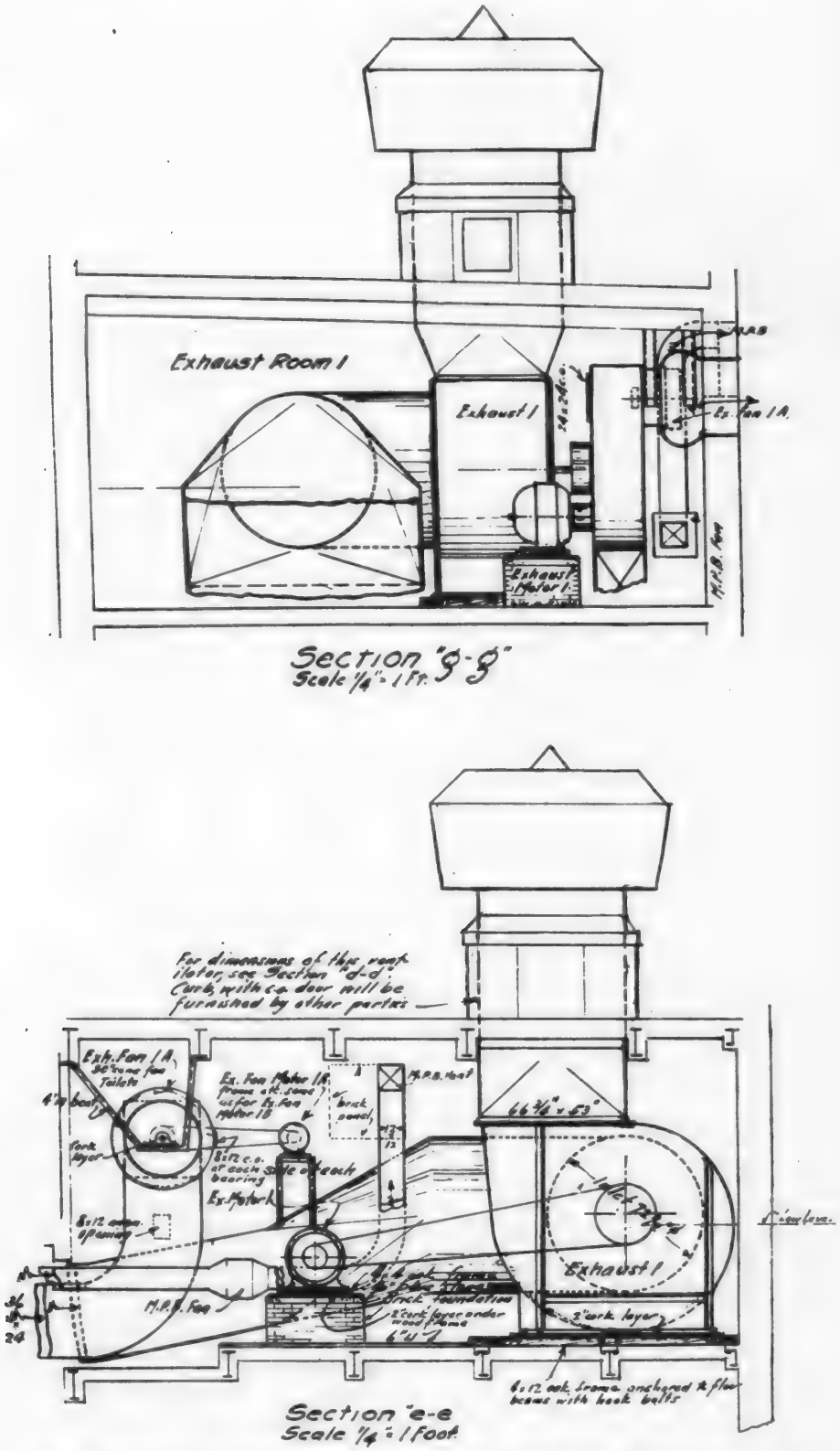

Exhaust Room 1
Exhaust 1
Ex. Fan 1A
Exhaust Motor 1
Section "g-g"
Scale 1/4" = 1 Ft.
For dimensions of this roof Motor, see Section "f-f" Curb, with c.a. door will be furnished by other parties
Exh. Fan 1A
Ex. Fan Motor 1A
Ex. Motor 1
Exhaust 1
M.P.B. Fan
Section "e-e
Scale 1/4" = 1 Foot

FIG. 10—TYPICAL ARRANGEMENT OF VENT FAN AND EXHAUST HEAD.

FIG. 11—TYPICAL VENT HEADS USED FOR CLASSROOMS AND ROTATING TYPE HEADS USED FOR TOILETS, WHEN EXHAUST FANS ARE OMITTED.

sometimes omitted and suitable aspirating ventilator heads are used at the top of each tier of vent flues. Fig. 11 is a view taken on the roof of a recent building and shows both the customary stationary vent heads used for class rooms and the rotating type heads used for toilet, when exhaust fans are omitted. The stationary type head here shown is also used to cap exhaust fan discharges, as in this case.

AUDITORIUM HEATING AND VENTILATING.

So far the author has discussed the heating and ventilating of the class rooms and other school rooms, but the auditoriums are treated somewhat differently. Fig. 12 is a photograph of a typical high school auditorium and shows the superb nature of these rooms. The ventilating and heating of these rooms are accomplished in a manner that is inconspicuous, although effective. The auditorium is provided with fresh air supply in the same way as the class rooms. Much of this fresh air supply enters the room through registers forming the window sills in front of windows as shown in Fig. 13. The fresh air supply for the auditorium is heated to the temperature necessary to replace the heat lost from the room through walls, windows, skylights, etc., and the warm air entering beneath the windows and rising in front of the windows so blankets these sources of cold that the seats near the windows are as comfortable as those in the center of the room.

It is not necessary to overheat the fresh air supply in order thus to warm the auditorium, as it is never necessary to have this air heated above 90° F. and it rarely exceeds 80° F.

One-third of the air supply enters below the gallery and two-thirds of the air enters through side walls above the gallery in a room of this type. For a single-story auditorium each window is blanketed by fresh air as above noted and only such additional air as is necessary is brought in through side wall registers near ceilings.

The vent outlets in most cases are in floors of aisles, but in the best arrangements there is a hollow leg to each seat and the vent outlet is through such hollow legs into a vent chamber underneath the floor.

The regular heaters warming the fresh air supplied to auditorium heat same only to 55° or 60° F. and the reheaters add enough heat to the air to maintain the room at a comfortable temperature. The reheaters are broken up into relatively small groups and each such group is automatically controlled by a room thermostat, located in the portion of auditorium supplied by respective reheater.

RECIRCULATION.

In order to conserve fuel, a system of dampers and cross-connecting ducts is so arranged that when the auditorium is unoccupied the air used to convey heat to the auditorium may be taken from the vent ducts, thus enabling the heating of the auditorium during periods of non-occupancy, by recirculation of the room

FIG. 12—AUDITORIUM, BUSHWICK HIGH SCHOOL, BROOKLYN.

air. This conserves the heat which would otherwise be carried away in the outgoing vent air and also avoids the use of the heat which would be required to bring the outdoor air up to vent-duct temperature. The reheating stacks alone, as a rule, are thus sufficient to warm the recirculated air enough to maintain a proper temperature in the unoccupied auditorium.

The attention of the attendant is forcibly drawn to the necessity for reversing the dampers and drawing from out-of-doors for ventilating of auditorium during occupancy, by means of suitable instruction plates fastened to engine throttle-valve and to motor-starting device. The throw-over dampers are operated by air-pressure from the riser-control board. (Fig. 5.)

MINOR DETAILS.

Thermometers are placed in each room in addition to thermostats, so that the room temperatures can be readily observed by occupants. Thermostats have locked covers so that unauthorized persons cannot adjust or tamper with same. Thermostats also have covers of such character that thermostat movements cannot be operated, or prevented from operating, by means of pins, flag sticks, etc., with which teachers sometimes thoughtlessly attempt to attach decorations to such covers.

All risers passing through class-rooms, etc., are covered with three plys of heavy asbestos air-cell covering wired on, and are then encased from floor to ceiling in neatly formed sheet-metal casings, so that covering will not be destroyed.

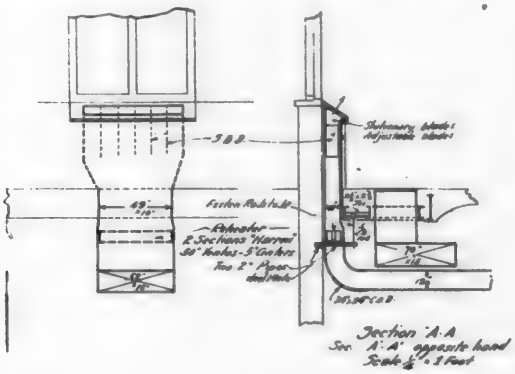
When exhaust-fans are omitted and ordinary ventilator heads are used over vent flues, dampers are placed in the base of each such ventilator head, and such dampers generally are operated by air-pressure from riser-control board, thus making it easy for the janitor to open and shut dampers in vent heads.

AIR-WASHERS.

While firmly believing in the efficacy and desirability of washing the air supplied for ventilating, we have rarely installed air-washers because insufficiency of funds has prevented same. In a few very dusty neighborhoods air-washers have been installed and the quantity of dirt removed by them from the air, being at least six 10-quart pails per one week from one such washer, is eloquent of their value.

BOILER-PLANT, ETC.

In the ordinary school of more than 16 class-rooms, steam-boilers designed to carry 100 lbs. working pressure are installed, but they are run at about 60 to 70 lbs. working pressure. This permits the boilers to be safely used at the normal pressure for practically the life of



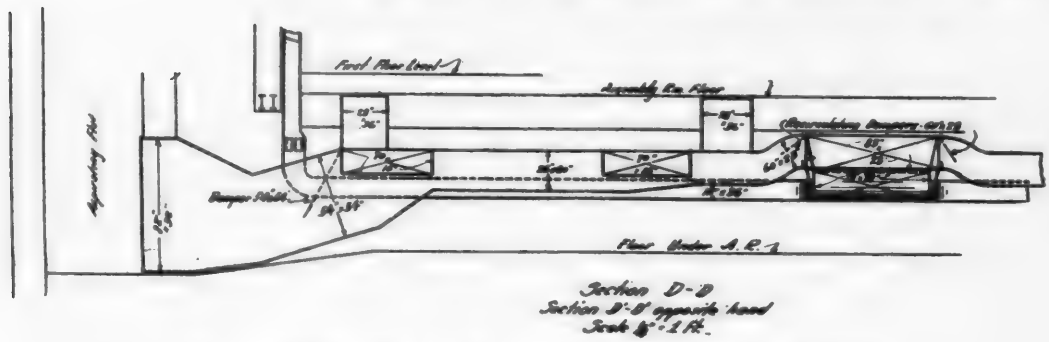


FIG. 13—FRESH AIR INLET UNDER AUDITORIUM WINDOW.

the boilers, which is often as long as 30 years.

Horizontal-tubular brick-set boilers have been used in most cases until within the last few years, although boilers of other types have been tried out as occasion warranted. (Fig. 14.)

While water-tube boilers have some advantages, they are more costly to install (in some units suitable for schools) and take more head-room than fire-tubular boilers, and under the peculiar service conditions of schoolhouse heating, they have not proven worth while.

There are now generally used boilers of an internally-fired return-tubular type, shown in Fig. 15, which have no brickwork to maintain and cost no more to install than the older brick-set horizontal-tubular bodies.

As nearly all the condensed exhaust steam is freed from oil and returned to the boilers, little fresh water is needed and the boilers do not form scale to any extent, even though no boiler compound is used. There is, therefore, no difficulty experienced with scale causing burned-out water-legs.

Forced draft of the under-grate turbo-blower type is being used on the boilers and a mixture of about 80 per cent. No. 3 buckwheat anthracite coal and the rest a good grade of semi-bituminous coal is being burned.

The grates have ⅛-in. air-spaces, and the draft pressure in ash-pit varies from nothing up to about 1½ in., water gauge. The use of this mixture has resulted in marked economy in cost of fuel over other fuels.

The boilers are equipped with high and low water alarms, low-water detectors, boiler water line regulators, soot blowers, safety valves, boiler feed-pumps, feed-water heater, etc., as is usual in ordinary power plants of good quality.

HEATING MAINS, ETC.

The steam run-out from each boiler is a section of 12-in. pipe with a straight-size 12-in. elbow, bushed in the sand to size of regular run-out, at top of same. By this means is obtained very slow flow of steam from boiler and no water is lifted over into steam-mains even though no steam-separator is used in boilers. This device has been found very much more efficient than steam-separators placed inside of boilers.

From the main high-pressure steam-header at boilers, connections are taken to steam-engines driving ventilation-system blowers, forced-draft blowers,

FIG. 14—BOILERS, BUSHWICK HIGH SCHOOL, BROOKLYN.

steam-pumps, etc., and each branch line is valved close up to header. From this high-pressure header (carrying 60 to 80 lbs. steam pressure) live steam, at reduced pressure, is also taken for use in the heating system, but only when the exhaust steam from blower engines, forced-draft outfits, pumps, etc., is inadequate to heat the building.

A back-pressure of 3 to 9 lbs. is maintained on the exhaust-lines whenever heat is needed, the greater pressure only being used in very cold weather, when all the exhaust-steam thus available is needed for heating.

The exhaust-steam used in the heating system is all purified by means of a large grease-extractor muffler combination, but the excess exhaust escapes to the atmosphere without passing through the grease-extractor. There is no by-pass around the grease-extractor and it is therefore impossible to turn unpurified exhaust-steam into the heating system or to get same back into the boilers.

When the heating system requires more heat than the exhaust-steam with back-pressure valve set at 9 lbs. can supply, then live steam from boiler-header is added in the following manner: (Fig. 16.)

Two pressure-reducing valves, each capable of providing steam for one-half the total heating load, are provided and so installed and adjusted that one will supply steam at 8 lbs. pressure so long as this supply and the exhaust together are adequate to carry the heating load, and the second reducing-valve will open us only when the line pressure in heating main drops to 7 lbs. or less in spite of the first reducing-valve and the exhaust supply.

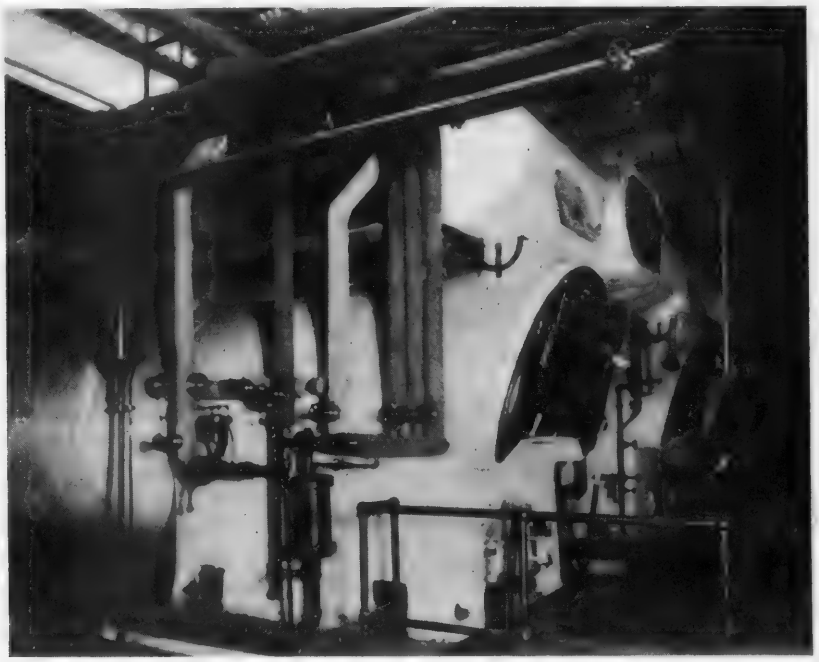


FIG. 15—INTERNALLY-FIRED, RETURN TUBULAR TYPE OF BOILER GENERALLY USED.

By this arrangement the reducing-valves do not wire-draw or cut their seats to cause leakage, and close regulation and economical use of live steam is effected.

The exhaust and reduced boiler-pressure together thus maintain about 7 to 9 lbs. pressure on this heating main in cold weather, when the exhaust is insufficient alone, but in mild weather these reducing-valves are closed off and the exhaust or back-pressure is reduced to as low a pressure as the lessened need for heat will permit.

The indirect heaters used as tempering stacks and reheaters for the ventilating system are supplied with steam directly from this heating main, as a pressure of 6 or 8 lbs. is necessary to

drive the steam into large groups of these indirect heaters, such as are used in blower systems, in sufficient quantity to keep the entire heater hot in cold weather.

On the other hand, a pressure of 1 to 2 lbs. is ample to thoroughly heat up the direct radiators in the class-rooms, etc., and a pressure in excess of 2 lbs. is objectionable because of noisy operation of radiators, too-quick filling of radiators when thermostats open steam-valves on radiators, greater risk to pupils in case of broken radiators, etc.

Therefore, the steam-pressure is again reduced from that carried on the indirect heaters to about 1 or 2 lbs. before admitting it to the steam-mains supplying direct radiation.

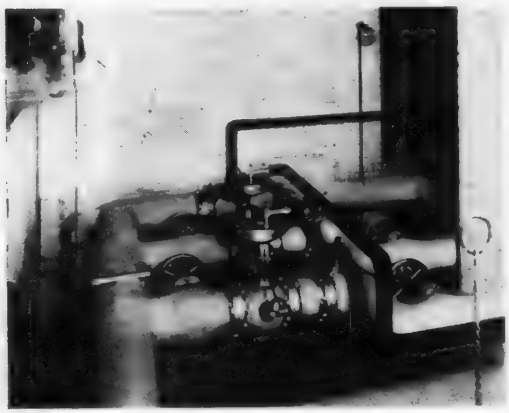


FIG. 16—ARRANGEMENT FOR AUTOMATICALLY SUPPLEMENTING LIVE STEAM TO EXHAUST STEAM SUPPLY.

For the same reasons as given in the case of the first reducing-valve combination, two small reducing-valves are used for this service, arranged one to open when reduced-line pressure falls below 1½ or 2 lbs., and the other when this pressure falls to about 1 lb.

By this combination of two heating pressures and two reducing-valves in each reducing combination, there are obtained practically noiseless operation, long life to valves, close regulation, continuous service and very satisfactory results in the heating system.

In order that no accident may occur in case a reducing-valve should stick open, a pop safety-valve is placed in each heating main on the low-pressure side of respective pair of reducing-valves.

PIPE COVERING, ETC.

The boilers are covered directly onto the shells with 1-in. asbestos blocks, wired on with chicken-wire netting, over which there is applied 1 in. of asbestos cement with hard finish.

The smoke-pipes, receiving tank, blow-off tank, large trap bodies and feed-water heater are similarly covered, with 1 in. air-space between surface of tank and blocks. All steam, exhaust, heating and hot-water lines are covered with standard asbestos covering neatly finished with 8-oz. canvas sewed on, except where such pipes are boxed in, in which case the canvas is omitted.

All ducts through boiler-rooms are wrapped with asbestos air-cell and canvas to prevent noise from plant being carried into class-rooms or auditoriums. In coal bins the ducts are covered also but the canvas is replaced by sheet iron flanged to ceilings (or side walls) to prevent coal from lodging on top of ducts or breaking same down.

All canvas on covering is painted to keep the dampness from spoiling covering; and the painting on pipe-lines is of colors to agree with a color chart, so that a strange engineer taking hold of the plant need have no difficulty in easily determining what each line carries.

In this connection each valve around boilers, engines, indirect heaters, etc., is also tagged with an easily readable number, and a valve sheet showing the location and purpose of each such valve is framed under glass, as is also the color chart, and mounted on wall at some point convenient to the fireman and engineer.

Sufficient tools are given the janitor to enable him to make most of the necessary minor repairs around the plant. Guard-rails and ample lights safeguard each moving part of plant and so far as possible safety and ease of operation have been provided.

Best Position For a Radiator in a Room

(Report presented at the semi-annual meeting of the American Society of Heating and Ventilating Engineers, in Detroit, Mich., July 19-21, 1916.)

The tests reported herein were conducted in the Mechanical Laboratory of the University of Michigan by Professor J. E. Emswiler, in charge of the experimental laboratory. They were made in Room 244 of the New Engineering Building, which is a room 22 by 26 ft., with the west wall exposed. Fig. 1 gives the principal dimensions.

A steel radiator was used which had welded joints, and 48 sq. ft. of rated surface. It consists of 12 sections 8¼ in. in width by 33 in. in height, and was provided with rubber hose connections to the steam supply, also to the drain and by-pass. The steam upon passing through a valve on the steam supply line entered the rubber hose leading to the radiator. On the steam inlet side of the radiator were placed a separator with a by-pass, a valve for controlling the pressure, and also a pressure gage. There was also on the steam inlet side of the

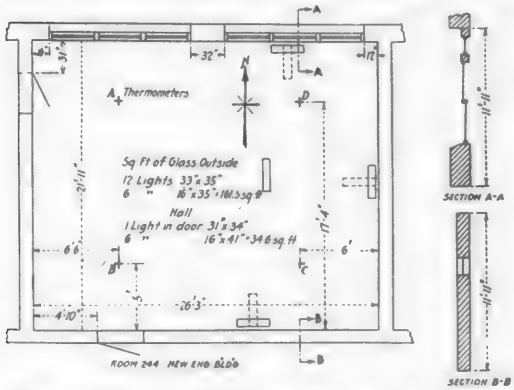


FIG. 1—ROOM IN WHICH TESTS WERE CONDUCTED.

radiator, an orifice to insure a slight superheat and a thermometer for obtaining the temperature of the steam entering the radiators. A U-tube was placed near the top on the return side of the radiator for obtaining the pressure in the radiator.

The return connections consisted of a receiver provided with a glass tube for noting the level of the water in the receiver, which level was kept at the same point when securing results. A pet cock was placed on top of the receiver, through which a small amount of steam was allowed to flow at all times, thus keeping the radiator free of air. The condensation was taken off at the bottom of the receiver through a valve and rubber hose connection to a weighing scales and weighed. Readings were taken at ten minute intervals, the tests on the average lasting an hour. To be sure that the radiator was free from air, a thermometer was placed between the radia-

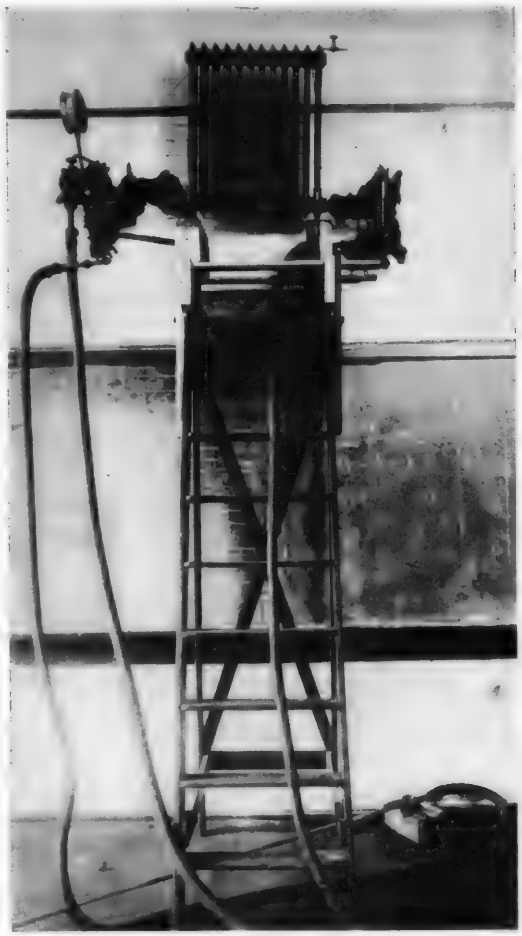


FIG. 2—ARRANGEMENT OF RADIATOR FOR TESTING IN ELEVATED POSITION.

TABLE 1—RESULTS OF THE 22 TESTS MADE WITH THE RADIATOR IN TEN DIFFERENT POSITIONS.

Test No.	Location of Radiator			Average Temperatures						Max. Temp. Range	Lb. Steam per 10 min.	B.T.U. per Hour	Value of "K"
	Wall	Floor or Ceiling	Perpendicular or Parallel	Outside	Inside	A	B	C	D				
27	West	Floor	Par.	20.4	69.8	68.7	69.6	70.3	70.8	2.1	1.815	10553	1.525
28	West	Floor	Perp.	18.3	70.5	69.4	70.3	71.1	71.4	2.0	1.990	11565	1.670
29	North	Floor	Perp.	16.6	70.4	69.1	70.0	72.0	70.7	2.9	1.942	11284	1.630
30	North	Floor	Par.	15.2	69.4	68.0	69.3	70.4	70.0	2.4	1.941	11284	1.620
31	East	Floor	Par.	12.9	69.2	67.6	69.7	70.7	69.0	3.1	1.968	11439	1.640
32	East	Floor	Perp.	11.4	69.3	67.7	69.7	70.9	68.8	3.2	2.000	11623	1.665
33	Center	Floor	East & West	10.6	69.0	67.7	69.1	69.7	69.4	2.0	2.034	11817	1.690
34	East	Ceiling	Par.	10.0	65.5	64.3	65.9	66.9	64.8	2.6	2.110	12262	1.710
35	North	Ceiling	Par.	10.5	64.0	64.0	65.6	64.4	66.2	2.2	2.105	12230	1.700
36	North	Ceiling	Par.	15.0	67.4	68.4	67.0	67.8	66.4	2.0	1.988	11550	1.633
37	East	Ceiling	Par.	13.1	67.7	66.5	67.8	69.3	67.1	2.8	2.087	12128	1.720
38	Center	Floor	East & West	13.1	69.7	68.6	70.1	70.8	69.3	2.2	2.184	12694	1.829
39	East	Floor	Par.	15.5	69.7	68.2	70.1	71.1	69.2	2.9	2.115	12269	1.730
40	North	Floor	Par.	16.4	70.5	68.9	70.6	71.9	70.7	3.0	2.116	12286	1.759
41	North	Floor	Perp.	18.0	71.4	70.6	72.3	72.4	72.4	1.8	2.105	12220	1.756
42	East	Floor	Perp.	20.8	75.6	74.8	75.1	76.9	75.7	2.1	2.082	12064	1.753
43	West	Floor	Par.	23.9	78.0	77.1	77.8	78.4	78.7	1.6	2.056	11898	1.730
44	West	Floor	Perp.	26.3	79.0	77.7	78.8	79.2	80.1	2.4	2.060	11935	1.770
45	West	Floor	Par.	32.8	77.1	75.5	76.5	76.9	78.9	3.4	1.704	9943	1.510
46	Center	Ceiling	East & West	29.4	73.8	72.6	73.7	75.0	73.8	2.4	1.750	10177	1.510
47	East	Ceiling	Par.	26.7	73.5	72.4	73.7	75.0	73.0	2.6	1.667	9695	1.440
48	North	Ceiling	Par.	27.2	73.8	72.6	74.0	74.6	73.8	2.0	1.684	9794	1.460

TABLE 2—AVERAGES OF THE RESULTS OF TESTS WITH RADIATOR IN TEN DIFFERENT POSITIONS.

Test No.	Location of Radiator			Average Temperatures						Max. Temp. Range	Lb. Steam per 10 min.	B.T.U. per Hour	Value of "K"	B.T.U. per Hour per deg diff. Air
	Wall	Floor or Ceiling	Perpendicular or Parallel	Outside	Inside	A	B	C	D					
27 43 45	West	Floor	Par	25.7	75.0	73.8	74.6	75.2	76.1	2.3	1.858	10798	1.588	219
28 44	West	Floor	Perp.	22.3	74.5	73.6	74.6	75.2	75.8	2.2	2.025	11750	1.720	224
29 41	North	Floor	Perp	17.3	70.9	69.8	71.2	72.2	71.6	2.4	2.024	11752	1.693	219
30 40	North	Floor	Par	15.8	70.0	68.5	70.0	71.2	70.4	2.7	2.028	11785	1.700	217
35 36 48	North	Ceiling	Par	17.6	68.3	68.3	68.9	68.9	68.8	0.6	1.926	11191	1.598	220
31 39	East	Floor	Par	14.2	69.4	67.9	69.9	70.9	69.1	3.0	2.042	11854	1.685	215
32 42	East	Floor	Perp.	16.1	72.4	71.2	72.4	73.9	72.2	2.7	2.041	11844	1.709	210
34 37 47	East	Ceiling	Par	16.6	68.9	67.7	69.1	70.4	68.3	2.7	1.955	11362	1.623	217
33 38	Center	Floor	East & West	11.8	69.4	68.2	69.6	70.2	69.4	2.0	2.109	12256	1.760	213
46	Center	Ceiling	East & West	29.4	73.8	72.6	73.7	75.0	73.8	2.4	1.750	10177	1.510	229

tor and the receiver, thus giving a temperature check on the steam in the return. Fig. 2 shows the radiator in an elevated position preparatory to a test.

Twenty-two sets of tests were made between February 12th and 26th, 1916, with the radiator in ten different locations, seven on the floor and three elevated. Table 1 gives results obtained from these tests. Table 2 is obtained by averaging the results given in Table 1 for the ten different locations. Curves were plotted showing room temperature average, outside temperature and weight of condensed steam at ten minute intervals. The results obtained are quite consistent. They cover not an unusual range in values as will be noted from the following, taken from results as shown in Table 1:

Outside Temperature, deg. F.	10.0 to 32.8
Inside Temperature, deg. F.	64.0 to 79.0
Maximum Temperature Range in Room, deg. F.	1.6 to 3.4
Value of K (B.T.U. per sq. ft. per hour per degree of difference)	1.44 to 1.829

In averaging the results for the ten different positions the range is not so marked:

Outside Temperature, deg. F.	11.8 to 29.4
Inside Temperature, deg. F.	68.3 to 75.0
Maximum Temperature Range in Room, deg. F.	0.6 to 3.0
Value of K	1.510 to 1.760
B.T.U. per hour per degree of difference inside and outside air.	210 to 229

The greatest value of K 1.760, is obtained when the radiator is placed in the center of the room (see Table 2). This indicates that more B. T. U. are secured per square foot per degree difference between the steam in the radiator and the average temperature of the room, in this position than in any other. The temperature range indicated by the four thermometers, 2.0°, is next to the smallest and it will be noted that the B. T. U. given up by the radiator 213 B. T. U. per degree difference, is below the average. This last, however, may be due to other causes, such as varying wind conditions outside.

With the radiator placed in the usual position, parallel to the wall and under the exposed glass surface, the value of K is 1.588, the maximum temperature range in the room is 2.3° and the B. T. U. per degree difference given up by the radiator is 219 B. T. U. 1.51 is the lowest value of K, which was obtained with the

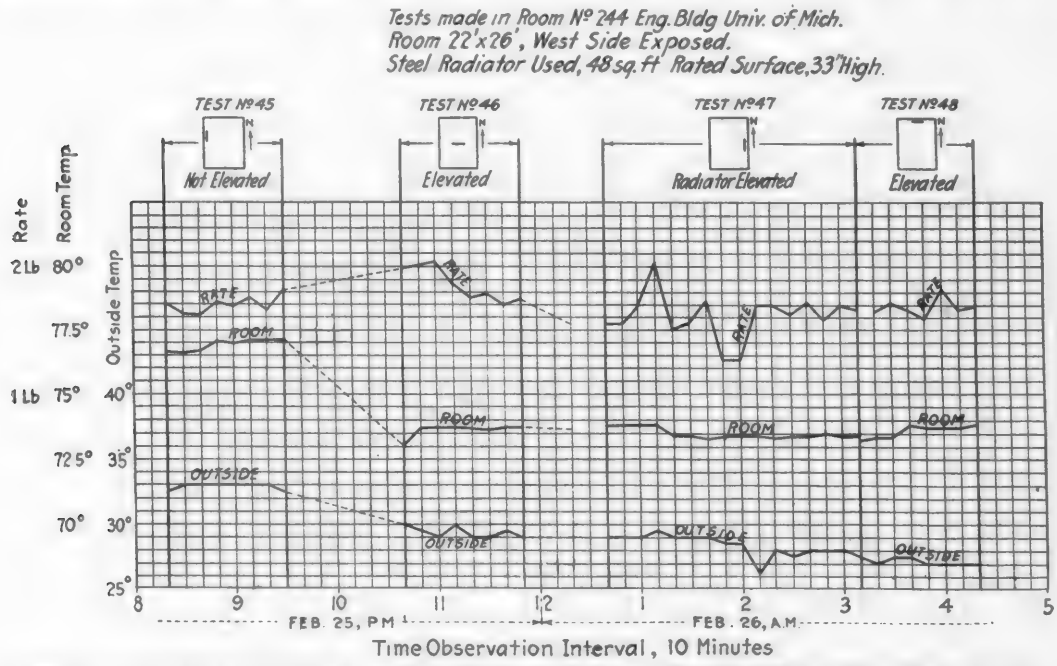


FIG. 3—CURVES SHOWING ROOM TEMPERATURES, OUTSIDE TEMPERATURES AND WEIGHTS OF CONDENSED STEAM PER 10 MIN. FOR RADIATOR IN DIFFERENT POSITIONS AND LOCATIONS IN ROOM.

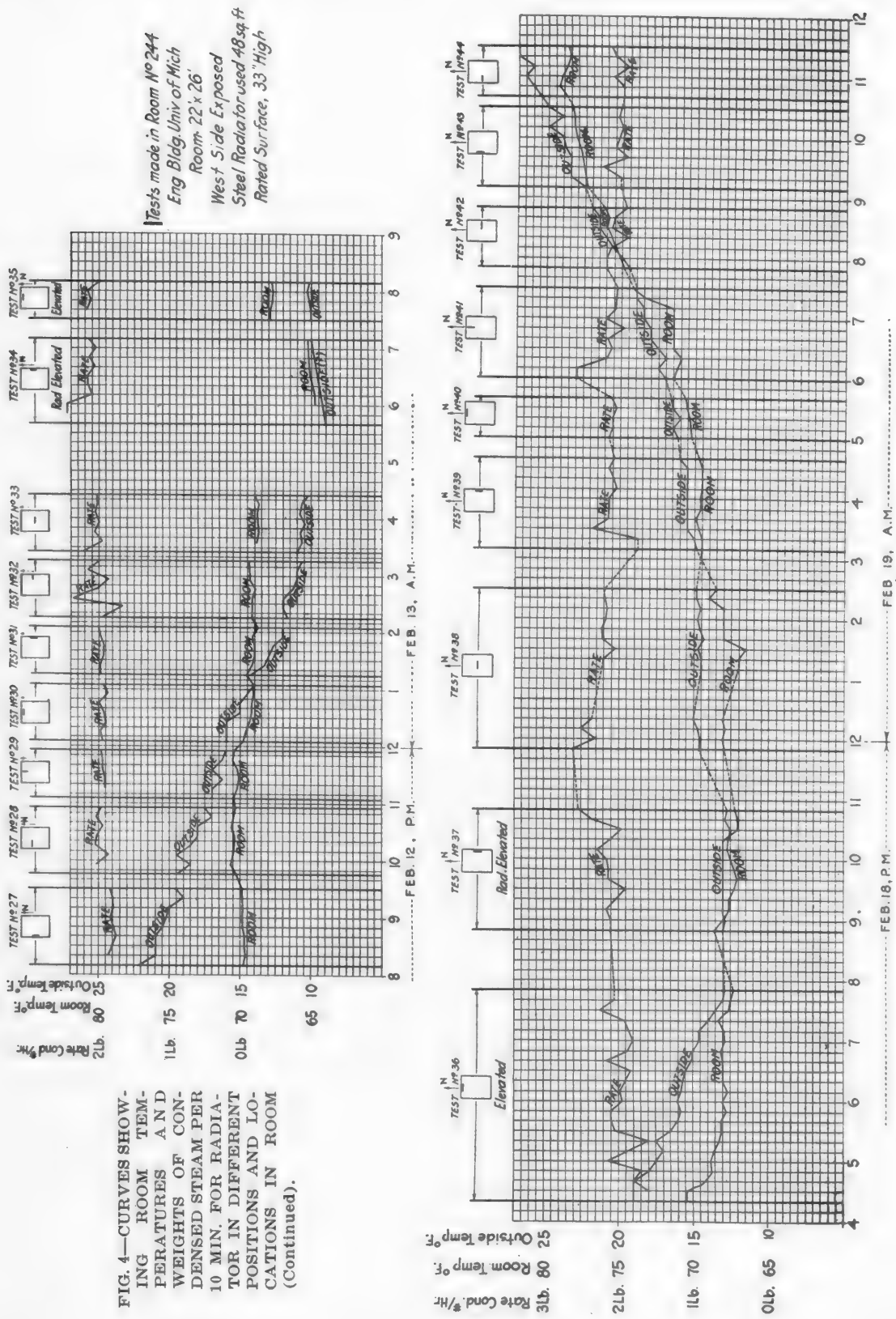


FIG. 4—CURVES SHOWING ROOM TEMPERATURES AND WEIGHTS OF CONDENSED STEAM PER 10 MIN. FOR RADIATOR IN DIFFERENT POSITIONS AND LOCATIONS IN ROOM (Continued).

radiator elevated in the center of the room. The corresponding value of the B. T. U. per hour per degree difference of outside air and inside air is 229, which is a maximum for the different positions.

The report was submitted by W. F. Verner, Chairman; J. R. Allen and R. Collamore.

The Fee-Plus-Cost System of Charging for Professional Service.

Plan Proposed for Architects That Could Be Easily Adapted for Engineers

By WILLIAM STANLEY PARKER.
Vice-Chairman of the Committee on Contracts and Specifications, A. I. A., and Published in the Journal of the American Institute of Architects for May, 1916.

A. THE PERCENTAGE SYSTEM.

The system of charging a certain percentage of the final cost of the work for the architect's services has become a firmly established custom. The strongest reason for this is that, by establishing a customary percentage, competition between architects on a basis of size of fee can be eliminated, and this must continue to be eliminated so that professional qualifications may alone form the basis of comparison.

As a matter of fact, this appears to be about the only legitimate reason for the creation of such a system, the other reasons that now exist being the result of the system, not precedent to it; as, for instance, the reasons most often given by an architect being that he has always used it and that other architects generally use it and therefore that owners are familiar with it and that it is recognized in the courts, in other words, that it is customary.

B. DEFECTS IN PERCENTAGE SYSTEM.

There are many defects, however, that are inherent in such a system of charging for the professional services of an architect.

A customary percentage for all architects assumes an equality of professional ability which obviously does not exist. In addition to this, the net profit which it is intended shall accrue to the architect for his professional service is dependent on many elements in the work over which he has little or no control, and which vary according to the work and the personality of the owner.

The variation in draughting costs can be very great and can easily eat up most, if not all, of the contemplated profit. Architects often confess to doing residences at 6 per cent, at a loss, making up for it by profits on commercial work. This of course is not a business proposition. Each client should pay the legitimate expenses connected with his work and a reasonable profit for the personal services of the architect.

To a certain extent changes are made during the progress of any work. Frequently these are aggravated in number and in resulting expense to the architect, solely as a result of the client's attitude toward the work and yet without exceeding the legitimate duties of the architect. In such cases the burden of personal service of the architect is increased and his profit is not increased but is steadily reduced, not only through increased draughting costs but in many cases because the change is made to reduce the cost of the work and this automatically reduces the compensation.

C. RECOGNITION OF THE DEFECTS.

Architects recognize and partially correct these defects in the system by charging different percentages for different types of work. In determining these different percentages the architect must consider the varying amount of personal service involved and the probable average cost of draughting required in the different types of work, and then set percentages that will be generally adequate. He may for instance have three different rates, one for lofts, warehouses, and similar buildings, one for miscellaneous public and private work, and one for residences; or he may have other classifications to suit his own practice.

D. FEE-PLUS-COST SYSTEM.

A system under which the architect charges a professional fee for his personal service, and in addition charges his various expenses at cost, is growing in favor, as it is both logical and flexible. When the study of a problem is started, an agreement is reached with the owner by which the architect is to receive a definite, guaranteed sum as his professional fee. Since this is guaranteed, it can reasonably be reduced to a minimum. The draughting and other expenses being charged at cost, the expense of all changes in the drawings is automatically taken care of. An owner who makes few changes will have a correspondingly small draughting charge to pay, and vice versa. The owner may fear that the draughting will not be done economically and his expense be thereby increased; but, if the owner is willing to trust his architect to administer the expenditure of say $100,000 for the material and labor on the work, surely he should be willing to trust the architect to administer the expenditure of from 1 per cent to 2 per cent of that amount to draughting. Moreover, if the architect's personal profit is independent of the cost of the work, the owner may well feel easier about the disinterested administration of his funds. While it is by no means a fact that architects deliberately "pad" the cost of the building by use of unduly expensive materials or methods, still under the percentage system they do benefit by such use and it is not to be wondered at if they, to a greater or less extent, adopt an attitude of passive acquiescence in expenses suggested by the owner or thoughtlessly included in the development of the problem. With his professional fee guaranteed, the architect is stimulated to devote his best endeavor to the interests of his client, whether it be in an effort to reduce the cost of the work, which an owner generally desires, or to perfect details of equipment. Also the owner does not have the somewhat galling reflection, when trouble occurs and extras are incurred, that he is paying the architect a commission on what he may consider to be the architect's mistakes.

It is generally acknowledged that the more complete the plans the lower the estimates will be. Under the percentage system this economy in estimates must be obtained at an expense in draughting that reduces the element of profit to the architect. Under the "Fee-Plus-Cost" system the architect is free to make the complete drawings that the work warrants at the expense of the client, who is repaid for this expense in a logical way, by the reduction in the estimates.

In any event, under the percentage system there are a number of items of expense that are customarily charged at cost, such as engineers' fees, clerk-of-the-works and incidental expenses. The "Fee-Plus-Cost" System merely goes one step further and adds at cost the expenses of draughting and overhead in the architect's office, and then adds to the total of these various items of cost a fixed item for professional fee.

It will be readily seen how adaptable this system is to all classes and conditions of service. A piece of work can be analyzed fairly accurately at the start, as to the degree of personal service involved, and a sum named as a fee that is mutually satisfactory, without any regard to the variable elements of expense involved in such service. These elements of expense, just as the larger item of actual cost of the work, can be estimated and reported upon for the information of the owner; but there is no reason why the architect should guarantee what the draughting will cost, any more than he should guarantee what the building itself will cost.

The adaptability of the system to the work of public, private and corporate owners has been demonstrated in actual practice for ten years.

E. DETERMINATION OF FEE.

Just as an average commission on the percentage basis is said to be 6 per cent, so an average fee on the "Fee-Plus-Cost" System might be said to be 3 per cent. It is fairly generally established that an architect's expenses on all classes of work will average half his commission, that frequently they will exceed it, and that if they are less than half it is looked upon as a piece of good fortune. In certain types of work, however, the expenses will be regularly less and in

others regularly more than half the commission.

The fee, however, should be determined directly by the personal service required, and not indirectly by the incidental elements of cost involved in performing the service.

In determining the fee, therefore, for each piece of the work, the architect should consider the intensity of personal service required of him, the length of time during which such service is to be rendered, and the responsibility involved in such service, which last element has a certain relation to the financial investment involved in the undertaking of the owner. The sort of service demanded in connection with a large private residence will manifestly be greater, in proportion to the expenditure involved, than that in connection with a warehouse.

Each architect must adopt his own individual scale by which to determine his fees, but it may reasonably be considered that 3 per cent of the cost of the work will represent a mean, the fee being greater or less than 3 per cent according to the demands of the service to be rendered, and always taking into consideration also that the amount of the fee is guaranteed and need not be increased to take care of any uncertain expense items, as in the percentage system, but rather can be reduced to the reasonable minimum.

It is also to be constantly borne in mind that while the fee has been determined in connection with an estimated cost of the work, it is not to be affected by any difference between this estimate and the actual final cost of the work. If the scope of the work is changed so as materially to increase or diminish the intensity, duration, or responsibility of service, then the agreement with the owner should be modified to fit the new conditions. If the conditions of service remain unchanged the fee remains unaffected by the actual final cost of the work.

F. DRAUGHTING.

The cost of the draughting, that is, the net cost of the salaries of draughtsmen engaged on a piece of work, will vary according to office organization as well as according to the character of the work. It can only be estimated by each architect for himself in the light of his own experience. It will probably be found to average from 1 per cent to 2 per cent, with exceptions both above and below these averages.

Charges for draughting by the architect himself should not be made under this item. The fee is for the personal service of the architect. If it is his custom to do a considerable amount of draughting, or if a particular piece of work will involve an unusual amount of his own time for original design or detailing, the fee should be accordingly increased. It is not proper under this system for the architect to obtain profit otherwise than from his professional fee.

The cost of draughting should include the cost of writing specifications and also the cost of inspection by members of the office force other than the architect himself.

G. COSTS.

There are two kinds of cost-items, in addition to draughting, connected with the expenses of an architect's office:

(1) Those items easily chargeable directly to a particular piece of work, such as travel, long-distance telephoning, blueprinting, models, engineers, or clerk of works. These should be so charged.

(2) Overhead costs not easily apportioned:

These overhead costs, such as rent, light, heat, stenography, supplies and postage, have a certain logical relation to the total cost of draughtsmen's salaries, which relation will differ in different offices, but in each will remain fairly constant. Each office should determine this relation and in charging the draughting to each job, add a fixed percentage to cover the overhead charges. In an average office the overhead charges will probably approximate 100 per cent. of the draughting. If the architect as a general rule does most of his draughting himself, under the item of professional fee, as noted above, the overhead charges may very likely be more than the cost of the remaining draughting.

H. RENDERING OF ACCOUNTS.

Under this system accounts should be rendered monthly, each statement covering a payment on account of the fee, and

reimbursement of costs incurred during the previous month. The various items of cost offer no problems. Payments on account of the fee need to be predetermined.

Having settled the fee, it is well for the sense of security of the owner to set aside a sum, reasonably about 20 per cent. of the fee, to be paid on the issuance of the final certificate. The balance of the fee should reasonably be paid in monthly installments during the progress of the work.

Under the percentage system it has been customary to make a first payment of 20 per cent. of the estimated commission on completion of preliminary studies, 40 per cent. on completion of working drawings, and the balance as certificates are issued, which is generally monthly. These payments are related to the progress of draughting and, while customary under the percentage system, have no logical basis that warrants their adoption under the "Fee-Plus-Cost" System. The draughting charges, like all other charges for current expenses, are reasonably chargeable monthly as they occur; the professional fee, which represents the continuous personal service of the architect, is likewise reasonably chargeable in monthly installments as the service rendered. If a large proportion of the service is rendered at the beginning of the undertaking, these monthly payments, aggregating 80 per cent. of the fee, may be completed when the building is perhaps half done, no further payments on the fee being made until the final 20 per cent. is paid on issuance of final certificate. If, however, the personal service continues fairly steadily throughout the work, then a larger number of smaller payments would be arranged. For instance, suppose a $50,000 residence:—a professional fee of $2,000. Duration of the work from date of agreement to final certificate estimated at eighteen months. Retained for payment on issuance of final certificate, $400. Balance, $1,600, paid in sixteen monthly payments of $100, or perhaps ten monthly payments of $160, as conditions might warrant.

Rendering monthly charges against the fee in this way is advantages to the architect, in that it gives him a steadier income. It is acceptable to the owner, since it creates a definite monthly item of expense that is expected in connection with the other monthly expenses.

SUMMARY.

To summarize the arguments in favor of the Fee-Plus-Cost System, it might be said:

(1) The architect's professional compensation is made independent of the cost of the work.

(2) The architect's profit is based directly on the intensity and duration of his personal service and the responsibility involved.

(3) It is guaranteed and can therefore reasonably be reduced to a minimum that is proper in each case.

(4) All costs involved in a building project are paid for by the owner of that particular piece of work and are not in some cases compensated for by excessive payments by other owners.

(5) Excessive draughting required by an owner is paid for by the owner and does not operate to reduce the architect's profit. Also an architect is not tempted to curtail desirable draughting in order to increase his profit.

(6) While all costs are charged to the owner under this system there are only two elements of cost that are not charged in the same way under the percentage system, i. e., draughting and overhead costs.

Heating a Conservatory and Greenhouse

By J. D. HOFFMAN

(Read before the American Society of Heating and Ventilating Engineers, Detroit, Mich., July 21, 1916.

IN the spring of 1911 the author was asked to lay out the heating system for a conservatory and greenhouse building, then in the process of erection. As the conditions that had to be met were somewhat unusual and since it has now had five seasons of successful service, a description of the heating system may be

of interest to the members of the society.

Fig. 1 shows the location of the new conservatory relative to the old one, which had been fitted up in 1909, and from which building all the plant development in the new building was to be directed. Because of the close connection between the work carried on in the two buildings and to simplify operating conditions, the new heating plant was connected with the heating plant of the old conservatory. The latter was housed in a one and one-half story wing on the south side of a three-story building devoted to agricultural experiment work. The heating system in this plant was hot water, open tank type, with the radiators and coils

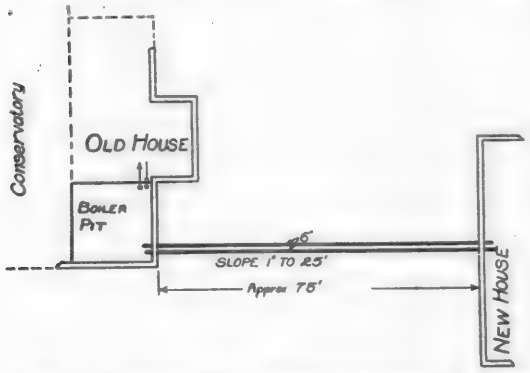


FIG. 1—CONDUIT CONNECTIONS TO NEW CONSERVATORY.

all connected on the downward-flow principle, i. e., all the hot water from the heater was directed first to the highest point of the circulating system and then subdivided to the various coils and radiators on the return flow. The old conservatory rooms were badly cut up and the heating connections were rather complicated, but this system was then giving satisfaction, and no changes were contemplated in that part.

The problem was to connect the new heating system of 5,000 sq. ft., by conduit to the old heating system having 1,200 sq. ft. of radiation, increase the heater plant from 1,850 to 8,000 sq. ft. rated capacity, reconstruct the system of mains at the heaters and serve both systems from the same plant without intering with the operation of the old plant.

The new conservatory consisted of a two-story brick front building with two 25x100 ft. greenhouse extensions. The second floor radiation in the conservatory was to be planned but not installed with the heating system; consequently the new system would operate for the present on the expansion tank in the old system. At a later date, if the second floor heating were installed, this tank would necessarily be raised to a higher position or moved to the new plant since the new elevation would be above that of the present tank.

The feature that caused the greatest concern in the union of the two systems was the fact that the circulating water had to be carried by conduit a distance of 100 ft. with a rise of less than 6 in. and then extended beyond this point a distance of 100 ft. through mains and coils, as shown in Fig. 2, with a rise of not to exceed 3 ft. The heaters had to set in the present pit. This was sufficiently low to give a fair depth of conduit, but permitted very little pitch to the mains. The heating plant was installed according to the plans without change. When completed every coil and radiator in each of the two systems did its work satisfactorily from the first firing and has

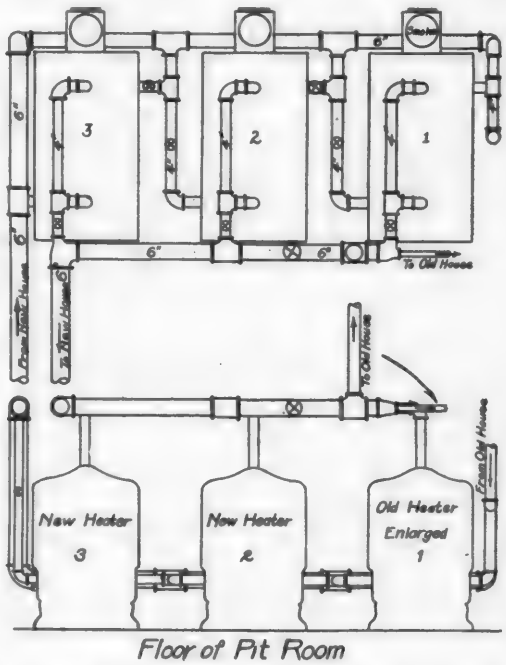


FIG. 3—REVISED HEATING PLANT IN OLD CONSERVATORY.

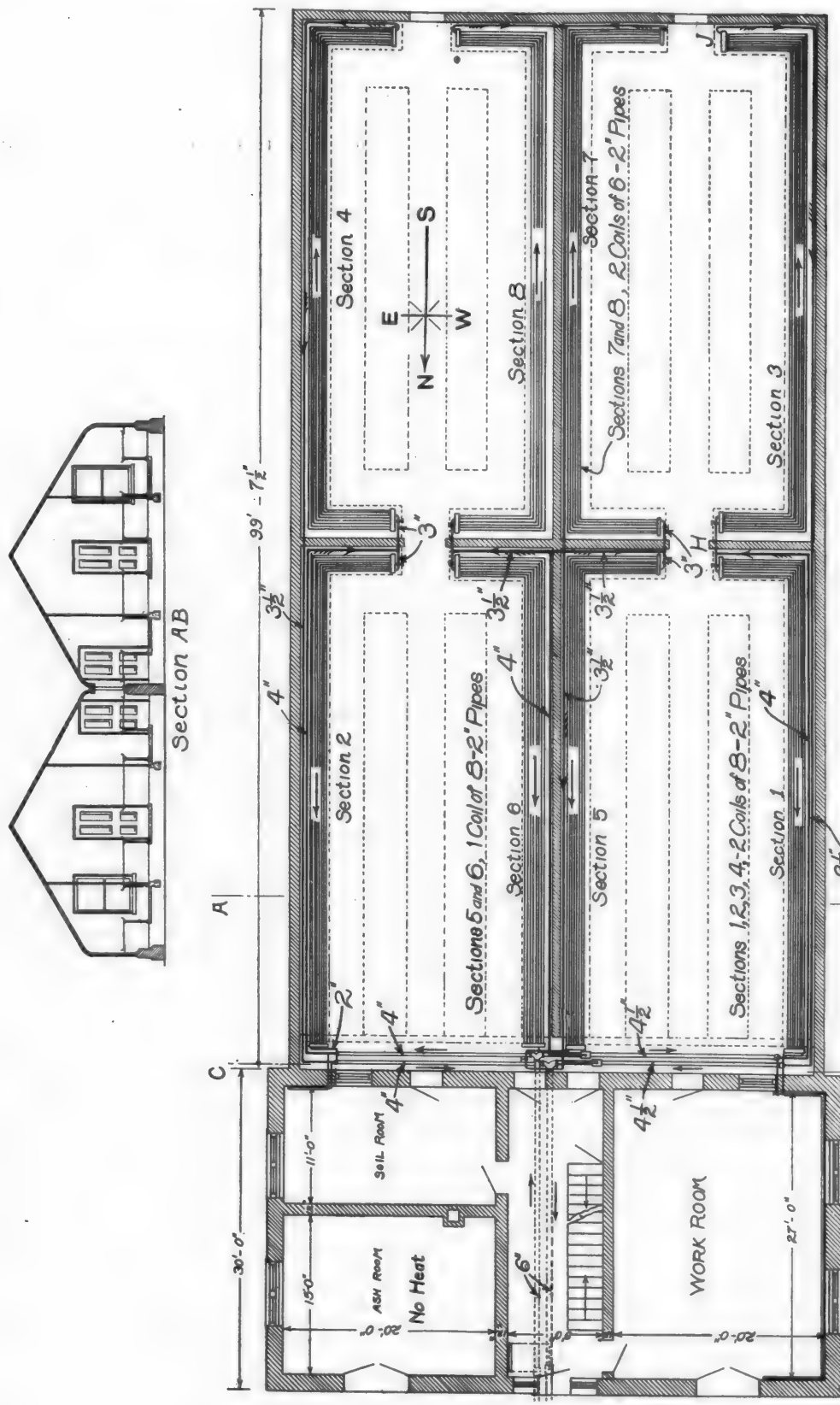


FIG. 2—GROUND FLOOR PLAN OF NEW CONSERVATORY.

been equal to the most extreme weather conditions experienced.

The calculations for the various rooms for an inside temperature of 70° F., an outside temperature of —10° F. and an average water temperature at the coils of 165° gave:

	Heat loss B.T.U.	Radiation Approx., sq. ft.	Coils
Work room	23800	140	280 lin. ft. 1½ in. pipe
Soil room	8500	50	100 lin. ft. 1½ in. pipe
Hall	12750	75	150 lin. ft. 1½ in. pipe
North greenhouse (each)	149600	880	5000 lin. ft. 2 in. pipe
South greenhouse (each)	168300	990	375 lin. ft. 3½ in. pipe 175 lin. ft. 4 in. pipe
Store room (later)	66300	390	
Basement (later)		150	
Total		4545	
Mains and branches		500	
		5045	

Two type W-25-8 Ideal boilers of 3,050 sq. ft. capacity each, were installed for the new plant. This was 20% above requirements and served as a safety factor. Provision was also made to enlarge the old boiler by three sections and make the three heating units equal. The two

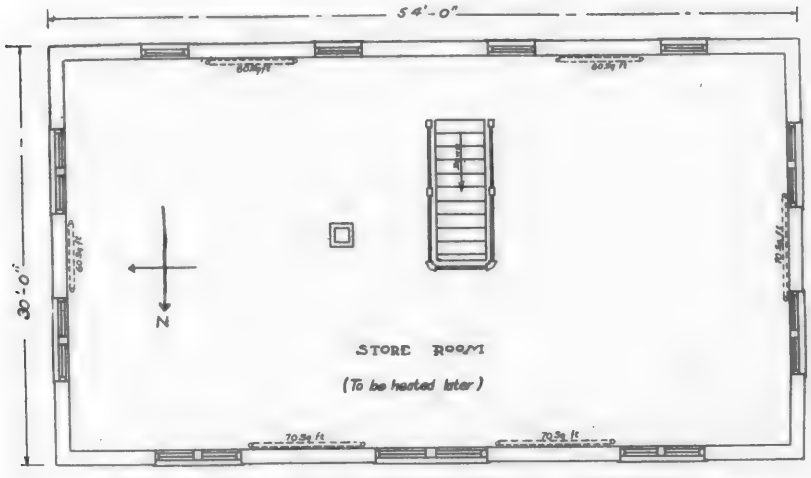


FIG. 4—PLAN OF CONSERVATORY BASEMENT.

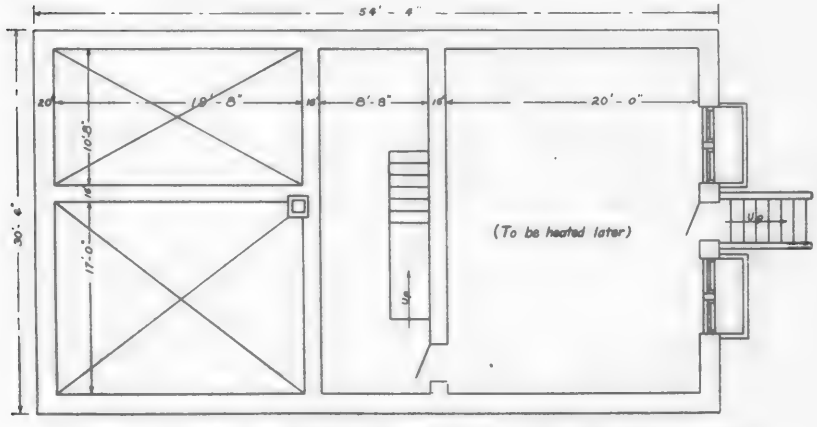


FIG. 5—PLAN OF SECOND FLOOR OF CON SERVATORY.

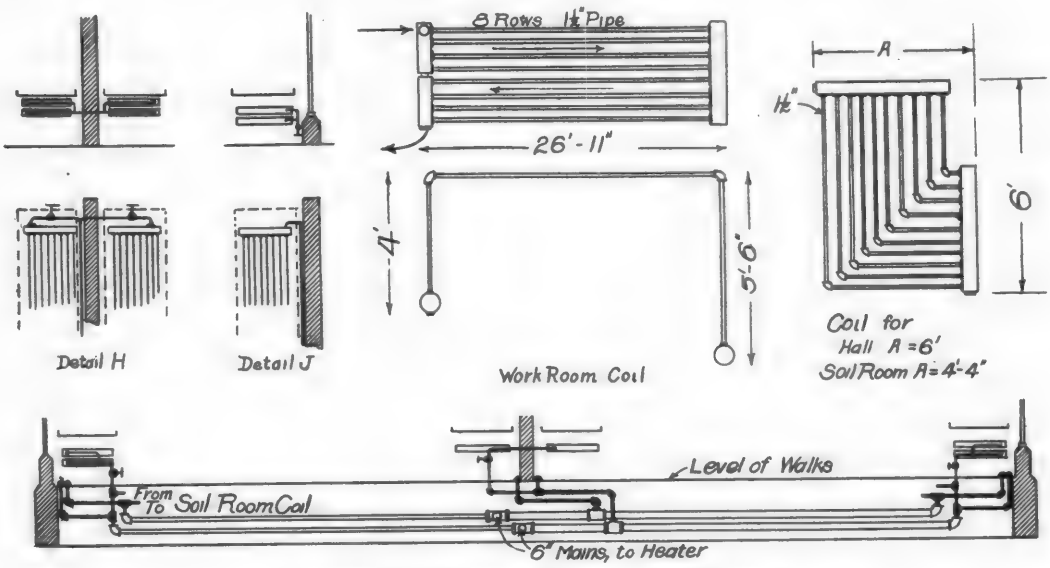


FIG. 6.—DETAILS OF COILS AND CONNECTIONS IN GREENHOUSE.

new units were connected to the old one, as shown in Fig. 3, in such a way that any heater could be used on either or both systems, as desired. The 66-gal. expansion tank was replaced by a 100-gal. tank. The system of mains was arranged to have a uniform rise from the heaters to the ends of the cross trench at the entrance of the greenhouses. From these two branch mains, risers and leads were taken off to the various coils.

The highest point in the greenhouse system is on the line H, Fig. 2, at the center of the greenhouses. The coils are fed along this line and the flow through the coils is toward the ends of the greenhouses. The coils farthest from the conservatory building, being at a disadvantage, were given a slight advantage in heating surface. All coils were built up with manifold ends and each section was valved with a straightaway valve, so that it could be cut out for repairs. Radiation was planned for in the second floor and the basement, Figs. 4 and 5, but was not put in at that time. Fig. 6 shows the details of the coils and connections to the mains.

The ninth annual meeting of the American Institute of Chemical Engineers will be held in New York City, January 10-13, 1917.

Government Experiments on the Transmission of Heat Through Walls.

It is well-known that the Bureau of Standards, at Washington, has been delving into the matter of the transmission of heat through walls, etc. This work has been undertaken with special reference to its bearing on the refrigeration and cold storage industry, but the same principles apply to a wall which is intended to keep in heat as to one intended to keep out heat.

In an address before the master steam fitters' convention, in Atlantic City recently, Dr. Hobart C. Dickinson, physicist of the bureau, gave some interesting details of the bureau's researches in this connection. As he stated, the problem, of course, is an old one, and all are familiar with tables of heat transmission through building materials. All are equally familiar with the very great discrepancies which exist in such figures, and the more carefully one goes into the available literature and tables the more he is convinced of the unreliability of the results which are available. The discrepancies, said Prof. Dickinson, are due partly to the complexity of the problem, and partly to the unreliability of many lists which have been made.

In considering the heat transmission through a wall, continued Dr. Dickinson, neglecting the matter of leakage of air which evidently depends upon tightness of construction, kind of ventilation, etc., the resistance which a wall offers to the passage of heat may be divided into several

parts; first and simplest is that of the solid material of the wall itself. Provided there are no large air spaces introduced in the material, heat is transmittable at a rate proportional to the different of temperature between the two surfaces of the solid material. Inversely proportional to the thickness, the rates for different materials are proportional to their thermal conductivities. The transmission is also almost independent of the actual temperature; for instance, between 0° and 10°, or between 80° and 90° F., inside and outside temperature the heat transmittable will be very nearly the same.

If we had reliable figures for the conductivity of all building materials, which the Bureau of Standards is now engaged in securing for experiment, this part of the problem of heat lost through walls would be completely solved.

CONDUCTIVITY OF BUILDING MATERIALS A SMALL PART OF PROBLEM.

Unfortunately this is a very small part of the problem. The occupants of a house, and hence the heating engineers, are not much interested in the temperature of the surface of the wall, but rather that of the air in the rooms. Nor do we often measure the temperature of the outside surface of the walls of a house, but rather the temperature of the air outside.

In order to escape heat must get from the air of the room to the surface of the wall, and from the outer surface of the wall to the outside air, and the resistance offered by the air next the wall on both sides is often a very good part of the whole. If the air is not disturbed by forced draft, the air films of the two sides of the wall may offer as much resistance to the passage of heat as an inch of pine. On the other hand, if the air is in rapid motion, or when a wind is blowing on the outside of a building, the resistance of the air layer may be practically nothing, and the wall surface may be at very nearly the temperature of the air at some distance from it, which is evident in the case of a window surface; the glass of an ordinary window by itself has very little resistance to the passage of heat, yet in practice the heat loss through window area is reasonably small, but it is probably nearly twice as great when a heavy wind is blowing as it is with no wind. The window loss would be from ten to twenty times as great were it not for the air films on the inside and outside.

Evidently a knowledge of the effect of air films is necessary before any complete tables of heat loss through walls can be accurately prepared. The effective resistance of the air film or layer depends upon numerous factors. It is not proportional to the temperature difference. It is not independent of the absolute temperature, as is the resistance of solid materials. Moreover, it depends upon rate of air circulation and height of the unbroken wall surface. This being the case, it is hardly to be wondered at that no adequate study of the problem has ever been made. In fact, as the rate of air circulation on the outside of buildings due to wind is beyond our control, so even if we knew the heat loss for all wind velocities, this knowledge would be of little value without a knowledge of the wind velocities.

THE BUREAU OF STANDARD'S EXPERIMENTAL APPARATUS.

The bureau is preparing—in fact, has most of the apparatus ready—for measuring the rate of heat transfer from air to wall under all kinds of conditions. Such measurements as this have never been satisfactorily made, and it is hoped that the results obtained will be valuable.

A somewhat simpler phase of this problem has been under investigation at the bureau for two years or more. In various kinds of construction, between double windows in frame houses and in various other places closed, so-called dead air spaces are made use of for preventing heat loss. A knowledge of the effect of such spaces has proved of great importance in connection with the insulation of steel cars, refrigerator cars, household refrigerators, and the cold storage houses also, where air space construction is sometimes employed.

The bureau has made thousands of observations of the heat transmission from one wall to another, across air spaces from 1/32 in. to 3 in., for numerous heights, between 1 in. and 2 ft., and for a wide range of temperature difference, and these data are not yet completely assembled.

A University Directory with 32,000 Addresses.

Former students, alumni, faculty members, administrative officers and trustees of the University of Illinois are listed in a new directory published by the university at Urbana-Champaign, Ill. It contains over 32,000 names and addresses arranged alphabetically, as well as geographically by States and towns and foreign countries. The occupations are also included. The directory sells for $5.00.

THE HEATING AND VENTILATING MAGAZINE

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PUBLICITY for the work of the heating and ventilating engineers was given with a vengeance by the Detroit papers on the occasion of the engineers' recent meeting in that city. Such headlines as "Old Formulae Are Thrown in Discard" and "Heating Rules Change" are merely samples of the weird things expressed by the Detroit press. These startling headlines were inspired by some recent tests at the University of Michigan on heat losses through building materials which indicated that the usual coefficient of 1, ordinarily used in connection with glass surfaces, should be raised to 1.48.

The technical paper, however, that offered the best opportunity for the reporters' flights of fancy was one on the best position for a radiator in a room, which is reproduced in this issue. After noting that a position in the center of the room was favored as the point where the radiator would show its greatest efficiency, the reporters' pencils fairly ran riot over the engineering "errors" of the past in locating radiators under windows, while the necessary touch of humor was injected into the reports by the movements of the late homecomer who would crack his shins against the radiator as he groped across the room.

In short, the Detroit papers had plenty of "atmosphere" to their reports of the convention but succeeded as far as was possible in holding up the profession to ridicule. It is safe to say that the average Detroiter, in reading the newspaper reports of the meeting gained an altogether wrong impression of the character of the heating engineers' profession.

The reports as published were neither good newspaper work nor in accordance with good newspaper ethics. Heating engineers owe it to themselves to prevent, as far as possible, this kind of publicity and while it is impossible to censor the writings of the reporters, it is quite possible to prepare, in advance of or during engineering meetings, suitable reports that may be given out for publication and which will present the activities of the profession in their proper light. The local chapters or other organizations, for their part, can do much in this direction by promptly calling the editors' attention to the incorrect presentation of reports or to engineering misstatements in general.

FOLLOWING the plan of publishing occasional special numbers, the October issue of THE HEATING AND VENTILATING MAGAZINE will be a smokeless boiler number. Articles representing the viewpoints of the manufacturer, engineer and contractor on the smokeless boiler situation will be included, as well as a discussion of smoke ordinances for large and small cities and other matters dealing with the rapidly-growing use of smokeless boilers, with a view of securing smoke abatement as well as greater fuel economy.

THE CONSULTING ENGINEER

The Consulting Engineer" is prepared to reply, in this department, to any questions which our readers may ask regarding problems connected with the design and installation of mechanical equipments of buildings.

64—Heating Costs for Dwellings.

QHESTION: Can you tell us what is good heating practice per cubic foot for an ordinary brick dwelling, exposed on all sides, in a climate such as we have in Dayton or Cincinnati, Ohio? The type of heating apparatus used is the ordinary warm-air furnace. I am trying to arrive at the cost to a householder of heating his residence, under average conditions, with Pocahontas coal.

ANSWER: As far as figures are concerned, it would be almost impossible to arrive at anything but a guess. A warm-air furnace presumes the use of outdoor air for ventilation, as well as for heating. In case air from the cellar is used and recirculated the fuel bill will be reduced considerably. Another very variable factor entering into the problem concerns the size and type of furnace in any given case. Most warm-air furnaces in private houses, especially those known as speculative houses, are about two sizes too small and in extreme weather the householder heats about one-half of the house, closing up the remainder until the weather moderates. Others do not heat their houses adequately, due to the expense of fuel.

In all of the cases above cited the total fuel bill will be considerably lower than if all outside air were used and all rooms adequately heated to 70° F. at all times. It has occurred many times that a steam or hot water system has been substituted for a warm-air furnace and the owner has been dissatisfied because there was no decrease in the coal bill and sometimes an increase over previous conditions. In such cases the increase in capacity of the direct steam or water system over that of the warm-air furnace, and the fact that all rooms were kept at 70° in all weather, were taken into consideration.

Another important point involves the use of storm windows or outside sash in winter, as they effect a saving in fuel of from 30 per cent. up.

If our correspondent will collect the data as indicated the writer will be pleased to analyze it for him. The data should include pounds of coal per week or known period, cubic feet of gas used per period and cubic contents of the house heated, also type of range used and whether double windows are use. If possible the area of the cold air box leading to the warm-air furnace should be added.

Relative Capacity of Steam and Hot Water to Carry Heat.

In Answer 63 of "The Consulting Engineer," published in last month's issue, on "What Is the Best Type of Heating System?" a comparison was made between the capacity of steam and hot water to carry heat. In this discussion it should have been stated that steam has a physical quality of giving up 1,000 B. T. U. approximately of latent heat when condensed to water, although it is 1,700 times the volume of water at atmosphere. It has a volume of 25 cu. ft. to the pound, so as, compared with water, with 25° drop, the quantity of steam required for the transmission of 1 B. T. U. or any given quantity of heat, would be as follows:

$$[1000 \text{ (lat. ht.)} \div 25 \text{ (cu. ft. per lb.)}] \div 62 \text{ (wt. 1 cu. ft. water)} \times 25 \text{ (press. drop)} = 40 \div 1550 = 2.6\%,$$ or

a cubic foot of steam conveys 2.6% the heat of a cubic foot of water under the conditions named.

Furnace Trade Stirred by University Booklet on House Heating.

An innocent-looking booklet on "House Heating," by J. L. Mowry, Division of Agriculturing Engineering at the University of Minnesota, has stirred up a hornet's nest among many sheet-metal and warm-air furnace men, one journal asking, in display lines, "Will You, Mr. Furnaceman, Stand for This?" The National Association of Sheet Metal Contractors, at its recent convention in Peoria, Ill., also took occasion to pass a resolution condemning the booklet in no uncertain terms.

The cause of all this outcry are the following statements made by Mr. Mowry in connection with a description of the principles of warm-air furnace heating:

"The principle of this scheme for heating is good, but there are many weak points

and objectionable features in practice. (1) It is hard to clean and to fire. (2) When made of sufficient capacity for the average-size house, the fire-box must be made in sections which do not fit tightly together, and the result is dirt, smoke and gas in the rooms. (3) The most serious objection is the influence of wind upon the circulation of distant rooms. It is impossible to carry heat against the wind more than 8 ft. or 10 ft. from the furnace.

"These facts, and the burning of the air in order to get heat sufficient to warm the rooms, limit the usefulness of this style of heating to small houses, and generally to one floor. To be successful, the furnace must be large and the pipes from 50 to 100% larger than are ordinarily used.

"First, floor pipes may be made any size and should be from 12 to 16 in. in diameter. Second floor rooms must be reached through rectangular ducts, about 4 in. x 14 in. in size, between studding. These are really much smaller than round pipes 8 in. in diameter. Unless special construction allows a large pipe to the second floor, it will be found difficult to heat upper rooms, especially to windward."

The statement, however, which aroused the most excitement was that "a hot-air furnace will last seven or eight years if repaired every two or three years. The hot water plant should wear 20 years and many have been used longer with little or no repairs."

In justice to Mr. Mowry it should be stated that when he came to a discussion of hot water heating he was no less free in his criticisms of this method, for he says: "Objections to this system (hot water) are: The need of safety devices, which may fail, and harder firing, which requires more fuel."

At the end of the booklet, in discussing costs, he says: The cost of a hot water system for a six-room house will be about $275 or $300. It will cost about two-thirds more than hot air, but hot-air outfits last only 7 to 9 years, with yearly repairs, while the hot-water system will last from three to six times as long, with no expense for upkeep.

"The cost of a hot-water system will be about $85 or $90 for radiators, $130 for the heater, and about $65 for installation. Any farmer who is at all handy as a mechanic can do the work, leaving $210 for the plant, compared with $175 for hot air.

"A hot-air system may give reasonably satisfactory results in small buildings, but for large houses and under most conditions, either steam or hot water is unhesitatingly recommended. The higher cost is more than offset, in a few years, by a saving in fuel and more satisfactory results."

STEAM HEATING ALSO CONDEMNED.

The bulletin concludes with the following crack at steam heating:

"Nothing has been said about steam systems. Little need be said. They are like water systems in makeup, except that the expansion tank is closed. There is no water in the radiators, only in the heater. There is no circulation until the water in the boiler is boiling, and there is pressure in the pipes and radiators. This pressure, while not intended to be heavy, may become so if not watched carefully. This is impossible in the average home. In the mill, factory or large flat building, there is reason for keeping a man on duty constantly, but not so in the home.

"By the process of elimination, it can safely be claimed that steam is not safe and hot water is not satisfactory, to any degree; while hot water, not perfect because it costs too much, is the best system of the three for heating the home."

Professor Mowry in responding to some of the criticisms leveled at him, writes: "I, of course, have been within range of numerous protests and criticisms upon the stand I have taken with respect to hot-air heating. The exceptions have been taken by men and firms exclusively in a section which is many miles south of Minnesota. They have overlooked the fact that the bulletin was made for Minnesota conditions, that the statements are drawn from observations as we find the installations in this section."

Current Heating and Ventilating Literature.

(Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the article mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.)*

COMBINED PLANT.

Problem in Combined Power and Heating (70771). Charles L. Hubbard. Ills. 3500 w. N E—June, 1916. Method of estimating approximate results under given conditions. 20c.

FACTORY HEATING.

How to Increase Factory Efficiency (70603 A). O. M. Becker. Ills. 3500 w. E M—June, 1916. Third of series of articles; how to heat the factory. 20c.

THERMODYNAMICS.

Flow of Heat from Solids to Air (70824 N). E. E. Snyder, C. S. Robinson, and W. K. Lewis. 1000 w. J I & E C—June, 1916. Investigation. 20c.

LEGAL DECISIONS

Discontinuance of Heating Service on Operation at Loss.

A steam heating company, which had supplied the city of Pana, Illinois, with heat for several years, notified the consumers that it could not furnish them with any more heat. The Illinois Public Utilities Commission, on complaint by the city, held that the utility could not discontinue service merely because it operated at a loss. The Commission has power to permit a utility to discontinue service where the conditions justify and demand it, and if the company could not serve the public without loss at the rates charged it should apply to the Commission for an increase of rates, or, after reasonable notice of its intention given to the public, for permission to discontinue service. (Pana vs. Central Illinois Public Service Co.)

The company subsequently applied to the Commission for permission to discontinue its heating system in the city. It alleged that during the last heating season the gross earnings were $1,867.84, and operating expenses during the same time were $4,102.49; that to attempt to increase the rate for the service sufficient to defray the reasonable charges therefor would result in a cost which consumers could not reasonably afford to pay; and that notice had been given to patrons. The application was granted. (Ex parte Central Illinois Public Service Co.)

Building Ventilation Regulations.

The Missouri Supreme Court holds that under Article XI, Section 1, of the State Constitution, for establishing a public school system by the General Assembly, and the Act of 1897, amended in 1909, providing that cities of 500,000 inhabitants shall constitute a school district and have certain corporate powers, including the care of school buildings, their ventilation, etc., a regulation of the St. Louis Board of Public Improvements as to building ventilation does not apply to the construction of school buildings, notwithstanding the city charter.—Board of Education vs. City of St. Louis (Mo.), 184 S. W., 975.

CORRESPONDENCE

Capacity of Heated Air to Carry Moisture.

EDITOR HEATING AND VENTILATING MAGAZINE:

In an answer to one of your correspondents, published in the August issue, on the subject of the capacity of heated air to carry more than 50% of saturation, the statement is made that in a drying installation in Cuba, the air was applied at such a high temperature that they had complete saturation when the outside temperature was 90° F., the air escaping from the dryer having every appearance of steam. How do you reconcile this statement with that quoted from "Kent," where it states that "as a carrier of moisture hot air cannot in practice be charged beyond half its full saturation; and it is, in fact, considered a satisfactory result if even this proportion is attained"?

It is probable that the statement in "Kent" means to imply that the latent heat taken up in the evaporating process so reduces the temperature of the air when it leaves the dryer that when it is completely saturated at the leaving temperature, the volume of moisture absorbed scarcely represents 50% of the absorbing capacity of the initial temperature of the air as it goes into the dryer. Such a statement would be correct, but in its present form the statement is not borne out in practice.

A cubic foot of air at 50° F. and 50% saturated will contain 2.12 grams of moisture. It would have a wet bulb temperature of about 42°, and a dew point of about 30.05°. Now, if we were to raise the temperature of this cubic foot of air to 200°, it would have a wet bulb temperature of about 88°, and would have a capacity to absorb 207 grains of moisture when completely saturated. The original cubic foot of air heated to 200°. would only be 1.025% saturated, if no other moisture is added. This original cubic foot of air at 50°, however, would expand about 29% by heating it. Therefore, the cubic foot of air at that temperature would not have the same carrying capacity as the expanded cubic foot of air would have.

In many instances, when applying blower systems to the drying of products containing considerable moisture, the product being of a character that would permit of heating it to temperatures above the boiling point, moisture has been evaporated at such a rate that the water passed off as steam, practically

coinciding with the volume in cubic feet of steam at 1 lb. pressure as given in the tables of properties of saturated steam.

For example: In Cuba a very large dryer was installed for drying sugar cane before the sugar is extracted from it. The cane averages 76% moisture and that is reduced down to 9% in less than 40 minutes at the rate of 150 tons per 24 hours, and with a volume of air that would indicate that the plant was handling about 26 cu. ft. of air per lb. of moisture, which is very close to the amount of steam in a cubic foot at atmospheric pressure.

If, however, provision is made so that heat is applied in the drying process sufficient to establish an equilibrium with the amount of latent heat absorbed by evaporation, then the temperature of the outgoing air would be just as high as the incoming air temperature and in that event there is no reason why the air could not be completely saturated at its initial temperature or its outgoing temperature.

Board of Directors Indorses Proposal to Change Name of Association.

In the report of the Board of Directors of the National Association of Master Steam and Hot Water Fitters, presented at the recent convention in Atlantic City, a definite stand was taken in favor of changing the name of the association. Following are the board's comments on this subject, as presented in the associations "Official Bulletin."

"Your board believes that the present name of our Association, 'The National Association of Master Steam and Hot Water Fitters,' is not the most fitting name for our organization as at present constituted; it admits more or less of an ambiguity, and is more suggestive of an association of journeymen than it is of an association such as ours.

"To give you an idea of what we have in mind, how would the following do: 'The National Association of Heating and Ventilating Contractors'? We do not submit this as a name, but merely as an example of what is possible, but if the idea in itself meets with your approval, we have to recommend that you appoint a committee to consider the question in all its phases and report on same at our next annual convention.

"In making this suggestion, we are not unmindful of the fact that to make the change will entail more or less work, and some little expense, but inasmuch as we are building for the future as much as for the present, we should hand down to those who succeed us a name which is consistent with what we really are."

The Progress of Standardization in the Steam Fitting Trade.

Following the preparation of a standard schedule of flanges and flanged fittings which has been adopted under different names by the National Association of Master Steam and Hot Water Fitters and by the American Society of Mechanical Engineers, as well as by other bodies, an effort has been made during the past year by the master fitters' association to develop a schedule of standard radiator valves. Early in the year the committee at work on this proposition made a tentative schedule of dimensions for radiator valves. This was presented to the Valve and Fittings Manufacturers' Association with a request that they consider it, the committee having learned from experience that in order to standardize any particular line of manufacture, the first and most important move is to get as many as possible of the manufacturers of that particular line to co-operate with it. The further course of events is told in the report of the standardization committee of the master fitters' association:

"We tried to make it quite clear that the schedule submitted was merely tentative and subject to changes if they found changes were necessary; that we were not after any particular set of dimensions, or any particular make of valve, but our whole purpose was standardization and interchangeability.

"The Manufacturers' Association acknowledged our request and appointed a special committee, of which Mr. John O'Brien, of the Fairbanks Company, was made chairman to consider the schedule.

"During the next two or three months we heard that Mr. O'Brien was organizing his committee and expected that they would soon meet us in joint conference.

"We waited patiently for some time expecting to hear from Mr. O'Brien and finally requested our secretary to get in touch with him and urge him to action, when we found that Mr. O'Brien had severed his connection with the Fairbanks Company, and had turned all the papers pertaining to standardization over to the Fairbanks Company, which in turn had laid them away and given no thought to them.

"We at once took the matter up with Mr. Houser of the Crane Company, who is

chairman of the general standardization committee of the Manufacturers' Association, and he was apparently surprised at the way matters had been dropped and promised to see that a new chairman of the special committee was appointed at an early date.

"On April 6 we received a letter from Mr. Houser requesting a conference with the chairman of your committee. This conference was held in our association headquarters in New York on April 14, and was attended by Mr. Houser, of the Crane Company, and Mr. Gordon, of Jenkins Bros., representing the manufacturers, and Mr. Child and the chairman of your Committee on Standardization, representing our association (W. T. English).

"At this conference there was considerable discussion as to how far the standardization of parts was to be carried, and some of the difficulties and expense of attempting to carry it too far.

"Considering the fact that our principal reason for standardization of radiator valves is for roughing in on new work and for making repairs on old work (the larger part of which will be either an entire new valve or a new hand wheel) it seemed to be consensus of opinion that if we standardize the center to face of the inlet and outlet of radiator valves with and without unions and the method of attaching the hand wheel, we will have all that is necessary. Repairs on other parts of a radiator valve occur so seldom that it seems unreasonable to ask manufacturers to go to the expense necessary to standardize the entire valve, as in many instances it would require an entirely new set of patterns and tools.

"Standardization is not going to keep the cheap and lighter grade of valves out of the market. We all have jobs where we are forced to use them.

"Taking this into consideration, isn't it better to standardize only the principal dimensions as suggtsted above, which will give us a chance to bring both the high grade and cheaper valves to the standard, because these changes can be made at small cost to the manufacturer, than to attempt to standardize all the parts which must necessarily make a high priced valve?

"We are of the opinion that if we are content to standardize only the parts referred to above, viz., center to face each way and method of attaching wheel, that an agreement can be accomplished with the manufacturers to do this, but if we insist on a complete standardization of all parts as shown in our tentative schedule, it would entail a big expense to the manufacturers, and we doubt very much if any or many of them would consider it.

"The conference was most harmonious, and Mr. Houser assured us that a new chairman of the special committee would be appointed at the next meeting of their general committet.

'We feel reasonably sure that tnis matter is now well in hand and we hope at our next convention we may be able to report an agreement with the manufacturers' association for some kind of a standardization of radiator valves."

Items to Be Considered in Figuring Overhead Expense.

In discussing the cost of doing business, at the recent convention of the National Association of Master Steam and Hot Water Fitters, one of the members presented the following list of items in the heating and plumbing business that should be considered in figuring overhead expense:

SALARIES.

Employers' salaries, less productive portion of same.
Executive officers' salaries (if incorporated).
Bookkeeper's salary.
Stenographer's salary.
Clerk's salary.
Other office help.
Stockkeeper's salary.
Driver's salary.
Chauffeur's salary.
Other non-productive labor.
Office collector.

RENT OR ESTABLISHMENT MAINTENANCE.

Store rent.
Shop rent.
Gas and electric bills.
Heating.
Depreciation on office equipment.
Depreciation on shop equipment.
Depreciation and repairs to tools.
City taxes.
County taxes.
Depreciation on real estate.
Maintenance of real estate.
Cleaning show room and establishment.
Fire Insurance.

DELIVERIES.

Barn rent.
Horse and wagon maintenance.
Depreciation on same.
Garage rent.
Automobile maintenance.
Auto truck maintenance.
Gasoline and oils.
Depreciation.
Liability insurance.

ASSESSMENTS, DUES AND DONATIONS.

Association dues.
Other organization dues.
Business life insurance.
Builders' exchange dues.
Chamber of commerce dues.
Donations.
Tickets.

SUNDRY BUSINESS EXPENSES.

Plumber's bond.
Compensation insurance.
Liability insurance on work.
Fire insurance on stock.
Government taxes.
State taxes.
Corporation taxes.
City taxes.
County taxes.
Telegrams.
Stationery and printing.
Postage and revenue stamps.
Expense—car fares.
Expense—cartages.
Collection charges (attorney's bills).
Commercial record or other credit information.
Office supplies.
Advertising.
Text books.
Buying directory.
Trade magazines.
City directories.
Signs.
Wrapping paper, packing boxes and barrels.
Attending convention expenses.
"First aid medical kit."
Typewriter and adding machine repairs.
Interest on notes payable.
Interest on investment.
Depreciation on stock and fixtures.
Lost accounts.
Lost shop time.
Depreciation on equipment.
Deadhead repairs or "come backs."
Incidentals, and all other items you pay for which you do not sell, except equipment.

This formidable list was characterized by President Bradley, of the association, as "some expense," but he added that it would bear investigation, as he wondered how many contractors were in the habit of figuring all of these items of expense in a year.

The discussion of the general subject of overhead expense brought out the fact that from data obtained the range of this item was quite remarkable, running anywhere from 8% to as high as 30%, although many figured their cost of doing business as between 22% and 26%.

In the case of a certain master plumbers' local association where most of the plumbers do steam fitting, an effort was made to get all the firms in the local association to report on the matter of overhead expense. Eleven firms responded on a total of $758,000 worth of business, half plumbing and half heating. The overhead expense averaged 22%, amounting to 26% on their cost.

Present Attitude of the Government Towards Trade Associations.

That a more helpful attitude towards trade associations is being taken by the government received fresh proof in an address by Edward N. Hurley, vice-chairman of the Federal Trade Commission of the United States, presented at the recent Atlantic City convention of the National Association of Master Steam and Hot Water Fitters.

After giving an account of the activities of the Federal Trade Commission, he went on to say:

The activities of trade associations, like yours, and similar business organizations, are manifold, and the business done by their members runs into the billions. These groups of associated business men are putting forth special efforts to improve systems of cost accounting, bettering their processes of manufacture, standardizing their output, obtaining credit information, and endeavoring to advance the welfare of their employes, and are bound to be most important factors in our country's development in the course of the next few years.

Special commendation should be given to associations that are endeavoring to build up industry in these constructive ways. Successful production and successful merhandising require many steps in the process of changing the form of the raw materials, and putting the product on the market at a figure adequate to cover the cost of production and the cost of selling and net some profit to the producer without charging the consumer an excessive price; and neither the individual business man nor the government alone can work out the many serious economic and business problems involved so successfully as a group of associated producers or merchants, laboring together in co-operation. These associations, when conducted intelligently and rationally, with the thought of bringing about improved business conditions, will make it possible for our industries to compete in price and quality in the markets of the world.

BETTERING CONDITIONS OF LABOR.

The question of giving to our workmen continuous employment so that longer pe-

riods of prosperity can be solved, and other plans for their welfare can be worked out, through trade associations. As we have grown in business capacity, we have come to realize that our employes are one of the most important parts of a successful establishment. That management is successful which is not only efficient in working out economies in production, but which also has the real interest of its employes at heart and which is anxious to have as many of its employes stockholders as possible, and which also realizes that without the hearty co-operation and enthusiasm of their men the best results cannot be obtained. Many corporations and firms ar now raising salaries and wages without the request from their employes. These benefits are commendable and should be supplemented by movements for the general welfare, planned and put into effect by our trade associations.

TRADE ASSOCIATION AND GOVERNMENT.

Business and government can co-operate through trade associations better than in any other way. The Federal Trade Commission's report on industries will furnish associations with facts and figures, not now available, which will enable them to assist in developing and stabilizing their industries. We talk much nowadays about industrial preparedness and the mobilizing of our industries in case of war. This can be accomplished through trade associations more quickly than in any other way. In the countries of Europe these associations, in co-operation with the governments, have been important factors in improving industrial conditions and particularly in extending foreign trade.

There should be a greater degree of organization and of mutual helpfulness in all lines of trade and industry, so that American business may be welded into a commercial and industrial whole; the part of the Government being to co-operate with business men, on request, to bring about the results that will benefit business and hence promote our national welfare.

VIEWS OF PRESIDENT WILSON.

President Wilson's views on trade associations may be of particular interest to you. In a letter addressed to me under date of May 12, 1916, he says, in part:

"Your suggestion, that trade associations, associations of retail and wholesale merchants, commercial clubs, boards of trade, manufacturers' associations, credit associations, and other similar organizations, should be encouraged in every feasible way by the Government seems to me a very wise one. To furnish them with data and comprehensive information in order that they may more easily accomplish the result that they are organized for is a proper and useful Government function. These associations, when organized for the purpose of improving conditions in their particular industry, such as unifying cost accounting and bookkeeping methods, should meet with the approval of every man interested in the business progress of the country."

UNIFORMITY IN ACCOUNTING METHODS.

The subject of more uniformity in cost finding is at present receiving the careful attention of trade associations. A number of trade associations are in this way achieving marked success in strengthening their industries. It is being demonstrated that a knowledge of cost determined by a uniform practice can improve trade conditions to a marked degree. By a uniform practice I mean a common classification of costs, a uniform method of distributing overhead expense, and a uniform method of providing for depreciation with rates more or less standardized. Where this condition exists, production statistics which are comparable and which will inform and guide the whole industry are obtainable. Manufacturers can then talk the same language and will be in a position to profit by each other's experience, to conduct their business more efficiently, and to establish prices more intelligently.

BETTER UNDERSTANDING BETWEEN GOVERNMENT AND BUSINESS.

Government has complained about business. Business has complained of the attitude of the Government toward business. Whatever justification there may have been in the past for such complaints, today there is a better understanding between Government and business. Since better business methods usually begin with better methods of cost accounting, scientific cost keeping becomes in a very definite sense the basis of our propsperity. The Government, through the Federal Trade Commission, by recommending the subject of costs to the business men of the country at this time, and offering to aid in the actual development of proper cost systems, is endeavoring to do a constructive piece of work which is of the greatest importance to the country. The problems of credit and finance, of foreign trade and unfair methods of competition, and of labor and capital,—all will begin to solve themselves once the subject of costs receives on every hand the attention it rightfully deserves.

Farnsworth Mfg. Co., Boston, has opened a branch office at 20 East Jackson Boulevard, Chicago, with C. O. Lindahl in charge.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Illinois Chapter.

The following nominations have been made for officers of the Illinois Chapter of The American Society of Heating and Ventilating Engineers: For president, Fred Powers and W. A. Pope; for vice-president, E. V. Hill and George J. Phillips; for secretary, A. E. Stacey and R. B. Hayward; for treasurer, August Kehm and J. P. Dugger; for board of governors, E. L. Hogan. J. P. Tuttle, G. W. Hubbard, W. A. Cameron, E. J. Claffey and C. W. Johnson.

Headquarters of Civil Engineers Now at Engineering Societies Building in New York.

Announcement is made that The American Society of Civil Engineers has voted to accept the offer of the United Engineering Society to become an equal partner with the three founder societies in ownership, occupancy and administration of the Engineering Societies Building, in New York, and all other activities which the societies may jointly undertake. The civil engineers until now have occupied their own building on 57th street, New York. Their action is the result of a letter ballot of their membership. The vote was 6 to 1 in favor of the proposition.

Three stories will be added to the top of the Engineering Societies Building for the use of the civil engineers. Eighteen societies, including the three original founder societies, now make the building their headquarters.

New York School of Heating and Ventilating Preparing for Fall Season.

Preparations are going forward for the fourth annual season of the New York School of Heating and Ventilating which commences Monday, October 9. All lectures will be given at Room 511, World Building. Two courses have been arranged of eighteen and twelve lectures, respectively, the first year course covering the principles of heating and ventilation, and the second year covering high pressure and power work. Both classes will be under the direction of Charles A. Fuller, consulting engineer, with Clark, MacMullen & Riley, New York. The fee for each course is $10, and a discount of 5% is allowed to those using the coupon printed on another page of this issue. George G. Schmidt, 132 Nassau street, New York, is secretary of the school.

Opening for Heating Engineer.

A civil service examination for heating engineer for the office of the New York State Architect, in Albany, N. Y., will be held September 30 in various cities throughout the State in connection with examinations for other positions. The salary is stated to be $1,500 and $2,500 a year. It is further stated that the position requires technical ability to design and supervise the installations of different forms of heating and ventilating systems. At least five years' experience in the detailing, design or installation of mechanical equipment of buildings, power stations, etc., will be required. Credit will be given for technical education to an extent not to exceed two years' practical experience. Application planks must be filed in the office of the commission by September 20.

Fan Foundations for Noiseless Operation.

Fig. 1 shows a method of framing for fans, overhung pulleys and motors. The base of the apparatus is bolted to this coping with ½-in. lag screws, the coping being 3 in. all around larger than the base of the apparatus, and constructed of 3 in. x 8 in. dressed and oiled yellow pine, having halved joints at the corners.

Four ¾-in. anchor bolts are countersunk as shown in Fig. 2. Contact of the anchor bolts with the apparatus is avoided by this method, thereby insuring against noise. Under each bolt head a ⅛-in. steel washer is placed, resting in turn upon a rubber washer 1 in. in thickness. Underneath the coping a further precaution against noise may be taken by installing two layers of

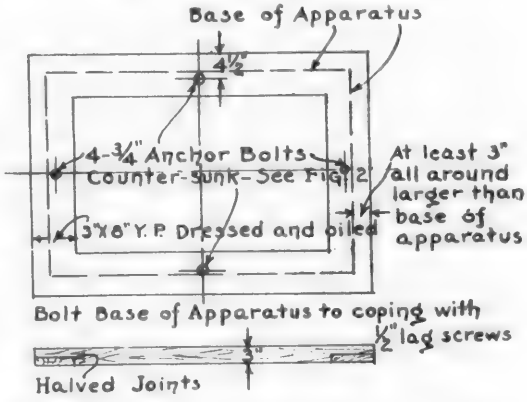

Base of Apparatus
4½"
4-¾" Anchor Bolts Counter-Sunk-See Fig. 2
At least 3" all around larger than base of apparatus
3"x8" Y.P. Dressed and oiled
Bolt Base of Apparatus to coping with ½" lag screws
Halved Joints

FIG. 1.—METHOD OF FRAMING FOR FANS. OVERHUNG PULLEYS AND MOTORS TO PREVENT NOISE.

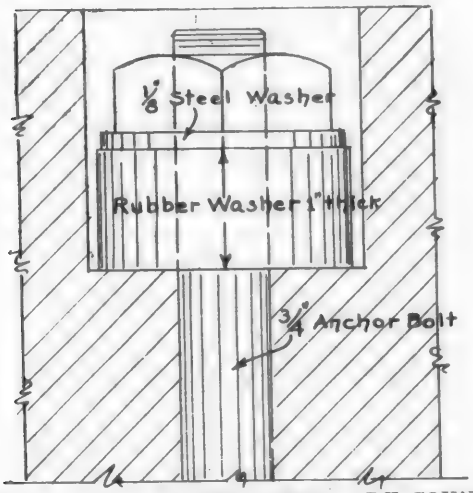


FIG. 2.—HOW ANCHOR BOLTS ARE COUNTERSUNK.

Nonpareil hard pressed cork, 2 in. in thickness. These rest directly upon the concrete foundation into which the anchor bolts are extended and imbedded together with 6 in. x 6 in. x ½ in. anchor plates. A complete installation is shown in Fig. 3.

Indirect Vento Stack Casings.

Vento stack casings arranged for gravity supply of air should be constructed of No. 22 gauge galvanized iron, using double lock standing seams. They should be substantially supported and put together with stack strips and bolts in such a manner as to be readily removable without breaking pipe connections and to permit access to the heaters. To protect the insulation the casings should be made of double construction which allows the insertion of ½ in. — 85% magnesia blocks. At the side or end of the stack casing two heavy 8-in. x 12-in. swinging clean-out doors should be provided with suitable catch plates placed in convenient positions. The most convenient arrangement of these doors is to have one near the bottom of the casing and the other near the top.

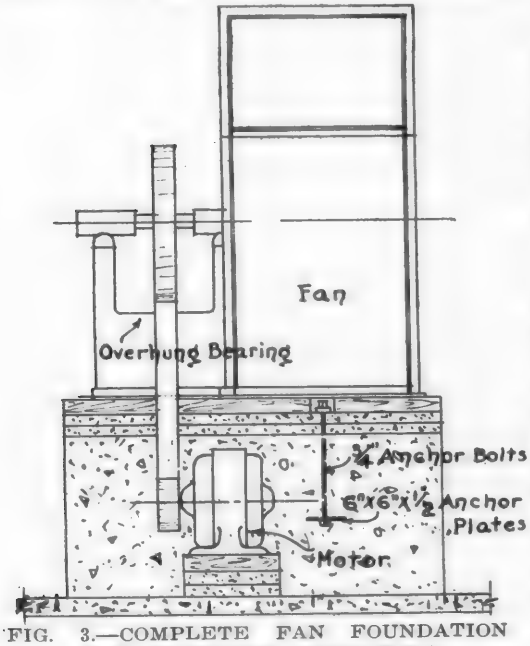
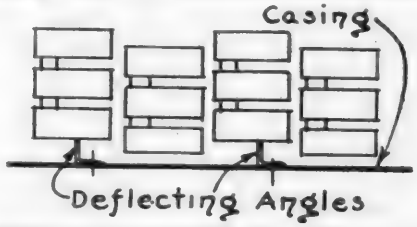


FIG. 3.—COMPLETE FAN FOUNDATION FOR NOISELESS OPERATION.

Staggering of Vento Stacks.

A simple method of staggering Vento stacks so as to obtain the maximum of heating effect is illustrated in the accompanying sketch. As shown, deflecting angles are secured to the Vento casing at every other row.



METHOD OF STAGGERING VENTO STACKS TO OBTAIN GREATEST HEATING EFFECT.

Detroit Section of Mechanical Engineers' Society.

A new section of the American Society of Mechanical Engineers is being formed in Detroit, Mich, the chairman of the temporary committee in charge being Ralph Collamore, the well-known heating and ventilating engineer of that city.

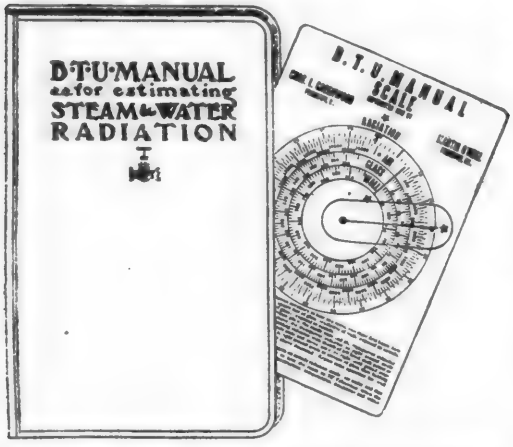
Plumbers' Indemnity Insurance Company Formed.

An insurance company has been formed in Buffalo, N. Y., with the object of assuming liability and compensation risks for Greater New York master plumbers exclusively. It is known as the Plumbers' Mutual Indemnity Insurance Company and was organized by E. G. Trimble & Co., of New York, Buffalo and Kansas City, Mo., which manages several other mutual and participating insurance companies.

The plan is to issue policies at the standard approved rates and, with the approval of the insurance department, return a 20% dividend in addition to maintaining the required loss reserves.

NEW BOOKS.

B. T. U. MANUAL FOR ESTIMATING STEAM AND WATER RADIATION is the title of a new booklet, including a celluloid radiation scale for quick figuring. The tables, it is stated,



B.T.U. MANUAL FOR ESTIMATING STEAM AND WATER RADIATION.

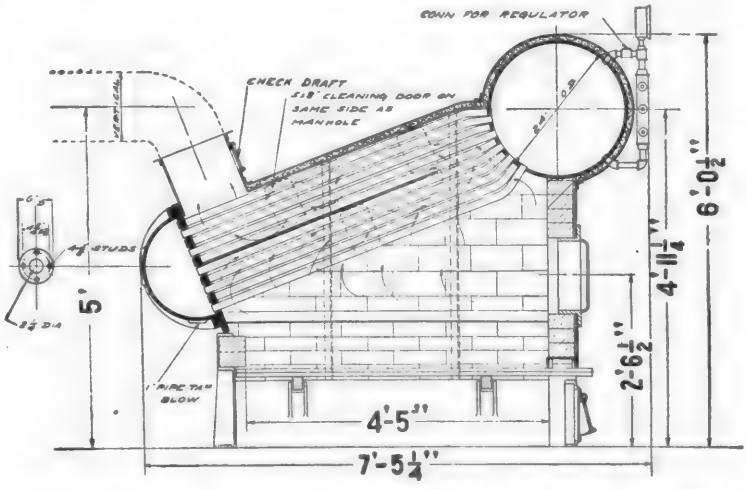
have been carefully compiled from the foremost authorities and are based on the actual transmission of B. T. U. through various materials, and the B. T. U. emitted by radiation at various temperatures, pressures, etc. The tables show water radiation above and below zero at all temperatures, steam radiation above and below zero at all temperatures, at various pressures and for various elevations above sea level; radiation for brick walls of various thicknesses; complete pipe data; table for proportioning single-pipe steam mains; sizes of air ducts and registers for indirect heating; radiating surface supplied by hot water mains; risers for hot water and much miscellaneous information. The manual is leather-bound, with leather pocket for celluloid scale, and is indexed. Size 4¼x6¾ in. Published at $5 by Greenwood & O'Neill, Princeton, Ill., or may be obtained through the book department of THE HEATING AND VENTILATING MAGAZINE.

CORRECTION OF ECHOES AND REVERBERATION IN THE AUDITORIUM, UNIVERSITY OF ILLINOIS, is the title of an interesting publication issued by the Engineering Experiment Station of the university and giving an account of the acoustic trouble that developed after the auditorium was built and the means that were taken to correct it. In seeking for the trouble, "bundles" of sound were projected in different directions and the paths of these were carefully traced. Various instruments, such as a ticking watch, a hissing arc lamp and megaphones were employed and curtains and draperies were hung at critical points suggested by the diagnosis. Certain of the walls were then covered with hairfelt, mounted on thin furring strips, with the result that at present a speaker with a moderate voice may be heard distinctly by auditors in the most distant seats of the large building. Dr. F. R. Watson of the Physics Department, and James M. White, supervising architect, had charge of the tests.

NEW DEVICES

The New Seabury Safety Heating Boiler.

The accompanying illustration shows the construction of the new Seabury safety heating boiler, of the low water-line type, which, as announced last month, has recently been placed on the market by Charles L. Seabury & Co., Morris Heights, N. Y. It is made in three sizes, having respective capacities of 2,500, 4,500 and 6,000 sq. ft. of radiation. The boilers are designed to carry a working pressure up to 50 lbs.



CONSTRUCTION OF SEABURY SAFETY HEATING BOILER.

As will be seen from the illustration, the steam drum rests on cast-iron columns and the water drum on a cast-iron bridge on which it is free to slide according to contraction or expansion of the tubes. Connecting these two drums is a nest of generating tubes on an incline. These tubes are expanded into the drum and the tube sheet and are of 1¼-in. seamless cold-drawn steel. They have just enough bend to enter the steam drum fairly.

The steam drum is 24 in. O. D. standard steel pipe while the bottom or water drum is made up of the tube sheet over which is bolted a cast semi-circular section cover plate.

The entire boiler, except the drums, is encased in a sectional sheet steel jacket, insulated with asbestos millboard. The steam drum is also insulated. Cast-iron fire and ash-pit doors are provided, as are also the necessary cleaning doors. The breeching is taken out of the rear and lowest part of the boiler top.

The boilers, it is stated, can be shipped from the shops entirely assembled and require no external brick or other setting, save the foundation piers. If preferred, the boiler can be shipped "knock-down" and assembled on the job. In that case the tubes are expanded into the drum and the tube sheet and shipped as one unit.

The manufacturer of this boiler is the same firm which for over 20 years has made the well-known marine and high pressure Seabury water-tube boiler. The company announces that it is now building a new boiler for the New Process Gasoline Co., Philadelphia, Pa., to carry 500 lbs working steam pressure.

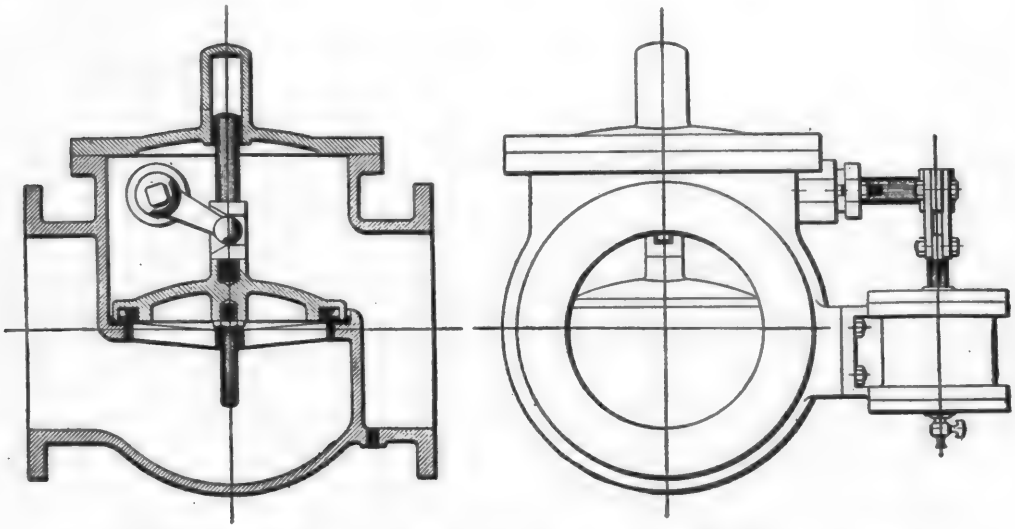
Scott Water-Sealed Automatic Back Pressure Valve.

Unique construction features are to be noted in the Scott water-sealed automatic exhaust relief or back pressure valve which is especially suited for use in connection with vacuum exhaust steam heating systems. Its construction makes it easily adjustable while it is carefully designed to seat tight, thus allowing no air to enter the heating system. This valve, which is placed in exhaust main between the low pressure cylinder and the condenser, is so designed that if the condenser should fail to operate and a back pressure form in the condenser, the valve will automatically open, allowing the steam to escape into the atmosphere. All possible leakage of air, it is pointed out, which would tend to destroy the vacuum in the condenser is obviated by the water seal which is an important construction feature of the valve. In its adjustable features, the valve can be regulated to open at any desired pressure and it is declared to be quite noiseless. When used in connection with exhaust steam heating, it is constructed so that any desired amount of back pressure can be carried for this purpose.

It is made in vertical, angle and horizontal patterns, all with ample water-sealing device. Access is had to the interior simply by removing the cover, and emphasis is laid on the fact that no bolts, nuts, pins or other loose parts are used in the interior of the valve. Large outside air cushioning dash pots are used, which can be regulated to meet desired conditions, and they have been found to remain constant in cushioning effect as they are not subject to condensation or other disturbances. The main stem is guided top and bottom through bronze bushings to maintain perfect alignment so that the disc will take perfect seating and true grinding.

SCOTT AUTOMATIC BACK PRESSURE VALVE.

XYLOFORM PAINT, described as the wall covering which can be washed when soiled, is a product of the Nash Engineering Co., South Norwalk, Conn., and is described in new circular matter. It is in the form of a powder and requires simply the mixing of cold water to prepare it for use.



HORIZONTAL TYPE SCOTT WATER-SEALED AUTOMATIC EXHAUST RELIEF OR BACK PRESSURE VALVE FOR CONDENSER OR HEATING SYSTEM.

New Type of Vacuum Cleaner.

A sanitary vacuum cleaner embracing new methods of dirt separation and its continuous automatic disposal, has just been placed on the market by the United Vacuum Appliance Company, Connersville, Ind., after three years of experimentation. This firm is well known as the manufacturer of Connersville vacuum cleaners, having succeeded the vacuum cleaning department of the Connersville Blower Company several years ago.

The most unique and valuable feature of this new machine is its centrifugal separator. As the dust-ladened air reaches the cleaner it is washed with water. By the use of a small rotor, the dirt and water are separated from the air by centrifugal force and discharged into the sewer under no pressure, during the time the machine is in operation. The washed dry air is discharged into a flue.

Because of this automatic disposal of the dirt, it is not necessary for the operator to handle sweepings; neither is it necessary to clean out tanks.

The centrifugal separating vacuum cleaner has only one valve. It is a swing check valve which opens just wide enough to discharge the water and dirt forced against it by the rotor of the separator. There is a small continuous spray of clean water entering the washing chamber so that when the tool is lifted from the floor, this water serves to cleanse the rotor and pipe line. The spray is drawn into the washing chamber from a box or tank, when the vacuum producer starts, and ceases to flow as soon as the vacuum drops to zero on shutting down the machine. This box is kept full of water by means of a ball float and valve. The float shuts off the city water supply

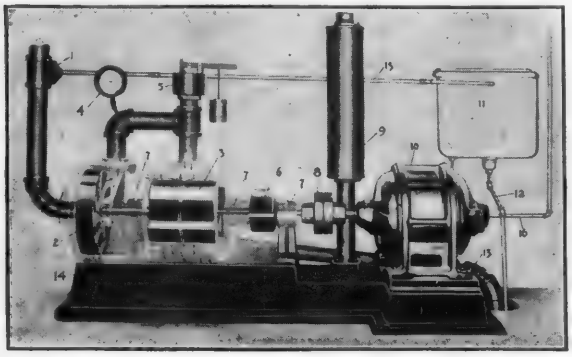


FIG. 1.—NEW TYPE OF VACUUM CLEANING MACHINE.

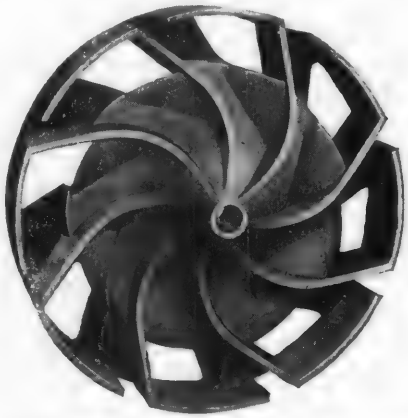


FIG. 2.—ROTOR USED WITH CENTRIFUGAL SEPARATOR.

as soon as the spray pipe ceases to draw from the box.

The water and dirt are at all times handled under high velocities, thereby preventing any deposits on the inside of the piping.

A number of machines of the centrifugal type have been sold during the past year and their performance closely watched

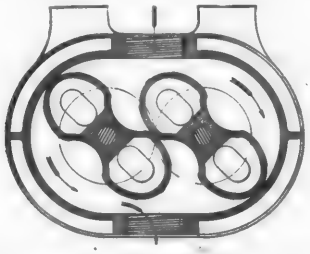


FIG. 3.—CROSS-SECTION OF VACUUM PRODUCER USED WITH NEW CONNERSVILLE VACUUM CLEANER.

with a view of having a perfected vacuum cleaner to offer the public when the real marketing began. The machines which have already seen service are installed in residences, public buildings, and commercial cleaning establishments with the gratifying result that they have proven practical for use wherever a vacuum cleaner is needed. For hospitals and sanatoriums these machines are particularly well designed, as the final disposal of all dirt and germs upon entering the cleaning tool is a most desirable accomplishment.

One strikingly interesting piece of work to which these machines are adapted is the removal of soap suds and dirty water from rugs, carpets or bare floors which have just been scrubbed. Such work makes much more rapid and easy the scrubbing of tile and concrete floors which has formerly been accomplished by the janitor on his knees with a hand-brush.

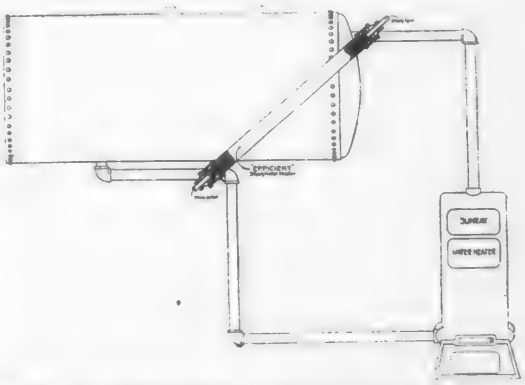
Fig. 1 shows a phantom of the complete centrifugal unit. Fig. 2 illustrates the rotor which is the moving part of the centrifugal separator, he design of which has been the result of numerous and exhaustive tests. Fig. 3 shows the cross section of the vacuum producer which is a Connersville double-impeller rotary blower.

Trade Literature.

KIELEY & MUELLER STEAM, WATER AND AIR SPECIALTIES, for use in the connection with power, heating and plumbing installations are the subject of a new catalogue (No. 27), issued by Kieley & Mueller, Inc., New York. The company announces that the word "Kieley" enclosed in a diamond is now cast on all its specialties. The catalogue is divided into eleven sections and covers such specialties as various types of pressure regulating valves, pressure controlling devices, boiler stop and check valves, back pressure and atmospheric relief valves and exhaust heads, steam and grease separators, muffler tanks and feed water heaters. Full, but concisely arranged, information is given of each device. Special attention is called to the fact that the catalogue supersedes all previous issues. Size 6x9 in. (standard). Pp. 316.

VALVE WORLD for August, 1916, published by Crane Co., Chicago, contains the eleventh installment of the non-technical chats on iron and steel and their application to modern industry, written by L. W. Spring, the company's chief chemist and metallurgist. The August installment is a continuation of the discussion of "cast-iron."

MOTT'S EFFICIENT HEATER for heating water in tanks by the use of low pressure steam is illustrated and described in new circular matter sent out by the J. L. Mott Iron Works, New York. The heater may be connected with any sized tank or may be used, with an automatic regulator, without a storage tank. When connected with a tank, an automatic



MOTT'S "EFFICIENT" HEATER FOR HEATING WATER TANKS WITH STEAM.

controlling valve can be set on the steam feed pipe to regulate the temperature of the water. The illustration shows the heater set diagonally in front of the tank. This position is necessary to bring the return pipe of the heater above the water line of the low pressure steam boiler.

ECONOMY OF TEMPERATURE REGULATION is the subject of a timely booklet issued by the Johnson Service Co., Milwaukee, Wis., and devoted to a presentation of the actual savings effected by temperature control, in addition to the comforts obtained. Quotations are included from the works of Prof. R. C. Carpenter, Byron T. Gifford, Prof. James D.

Hoffman, Nelson S. Thompson, Prof. John R. Allen and others, supplemented by letters and opinions from well-known practicing heating engineers. In connection with the reports received from colleges and universities, instances are given by Professor Allen of the fuel savings in the University of Michigan buildings, which are heated from a central station plant, running as high as 15 per cent. of the amount of steam required for the heating system. In this connection it is pointed out that the Johnson system of heat regulation is used almost universally in the college buildings throughout the United States, and a list is given of some of the more prominent installations. The catalogue then takes up examples of fuel savings in general practice, accompanied by fac simile letters, showing savings running as high as 30 per cent. The catalogue concludes with a report of an economy test made in the Rialto Building, Kansas City, Mo., published in THE HEATING AND VENTILATING MAGAZINE for April, 1915. Size 6¾x9¾ in. Pp. 38.

ANSWERS YOUR HEAT QUESTIONS is the title of a circular which is being sent out by Moline Heat, Moline, Ill., containing a chart first published by the American Radiator Company, showing the amount of coal required for a given amount of radiation for steam and hot water. The circular shows how the chart may be adapted for use in connection with Moline heat.

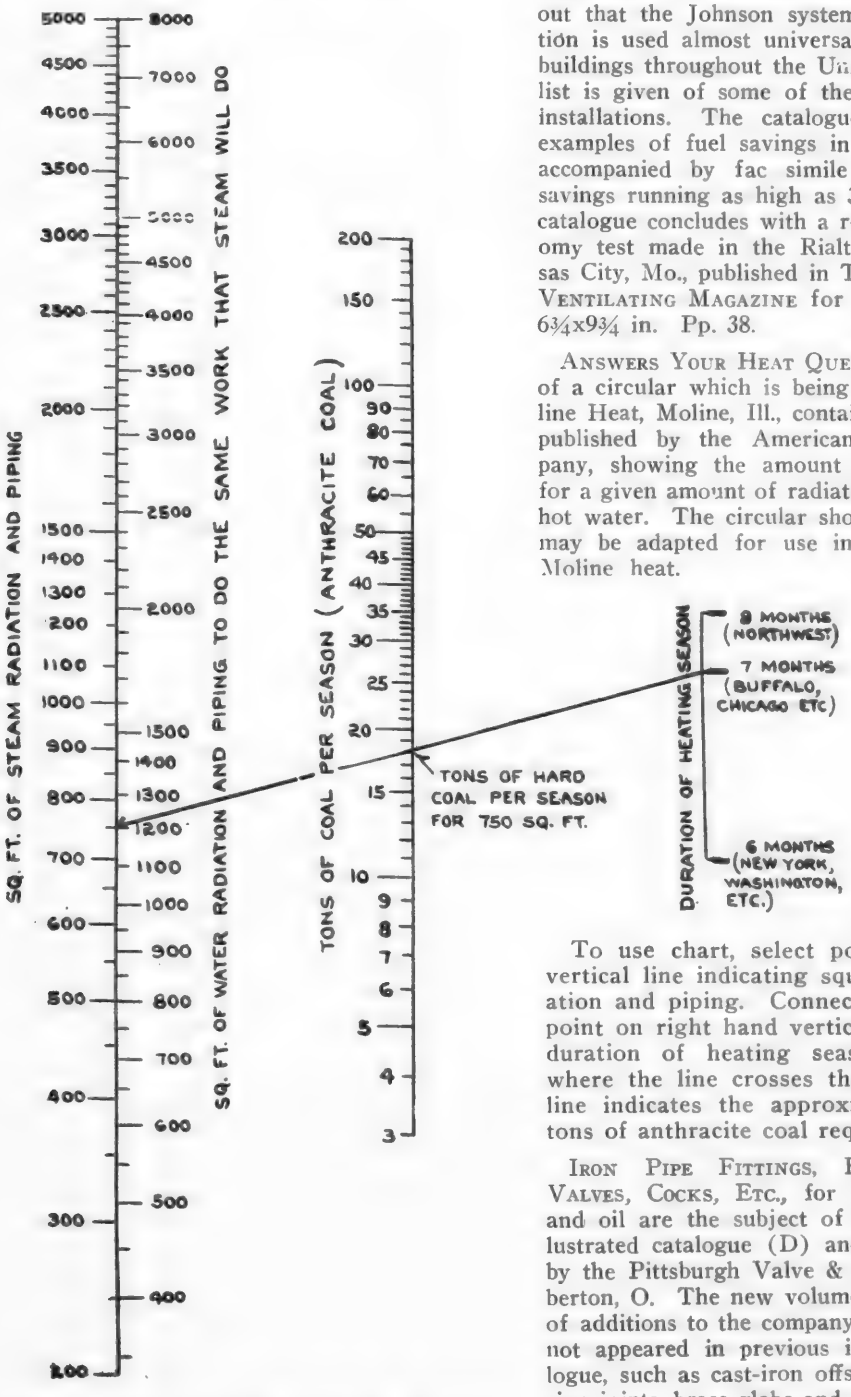

SQ. FT. OF STEAM RADIATION AND PIPING
SQ. FT. OF WATER RADIATION AND PIPING TO DO THE SAME WORK THAT STEAM WILL DO
TONS OF COAL PER SEASON (ANTHRACITE COAL)
TONS OF HARD COAL PER SEASON FOR 750 SQ. FT.
DURATION OF HEATING SEASON
9 MONTHS (NORTHWEST)
7 MONTHS (BUFFALO, CHICAGO ETC)
6 MONTHS (NEW YORK, WASHINGTON, ETC.)

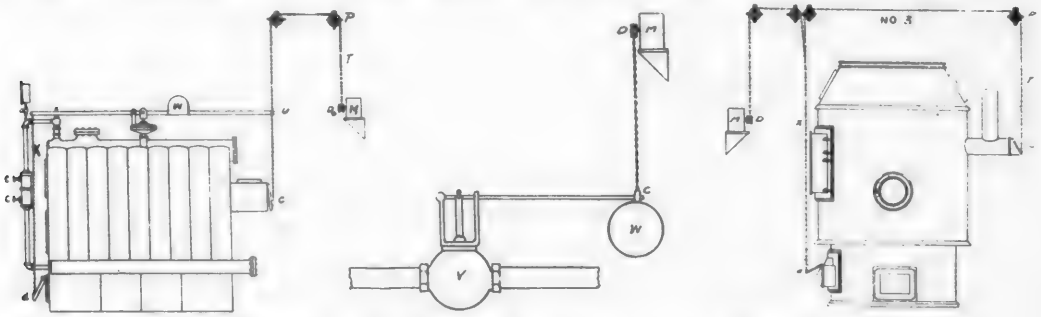
CHART FOR FIGURING AMOUNT OF COAL REQUIRED PER SEASON FOR STEAM AND HOT WATER HEATING.

To use chart, select point on left-hand vertical line indicating square feet of radiation and piping. Connect this point with point on right hand vertical line indicating duration of heating season. The point where the line crosses the middle vertical line indicates the approximate amount in tons of anthracite coal required per season.

IRON PIPE FITTINGS, BRASS AND IRON VALVES, COCKS, ETC., for steam, gas, water and oil are the subject of a new (1916) illustrated catalogue (D) and price list issued by the Pittsburgh Valve & Fittings Co., Barberton, O. The new volume shows a number of additions to the company's line which have not appeared in previous issues of its catalogue, such as cast-iron offsets, double expansion joints, brass globe and angle valves, brass gate valves, reducing 45° cast-iron ells, 60° cast-iron ells, radiator plugs and bush-

ings, malleable vacuum cleaner fittings, Simplex iron body gate valves and medium pressure iron body gate, globe and angle valves. Size 5x7½ in. Pp. 355.

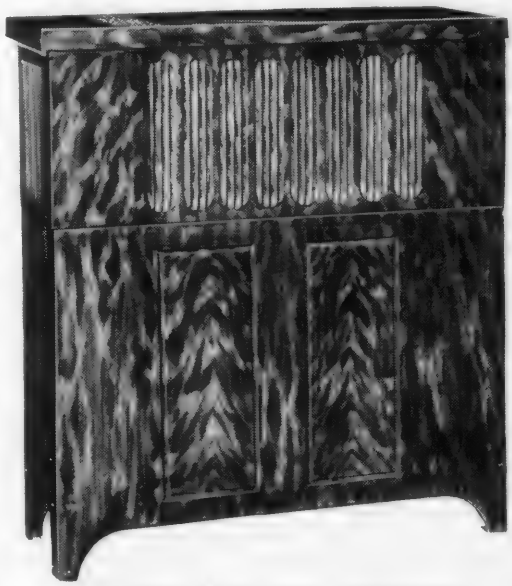
MARVEL TEMPERATURE REGULATOR, for controlling warm air heaters, steam boilers, hot water boilers, steam valves and gas valves, is a unique device, described and illustrated in a recently-issued circular published by the American Thermostat Co., Newark, N. J. The Marvel thermostat is a mechanical thermometer, actuated by temperature changes. It is used in connection with a special electric motor by which the heater is controlled. The non-winding motor is operated entirely by dry cells, thus eliminating the need of weights or springs. It is capable of lifting a dead weight of 25 lbs., and by adding an extra dry cell the power is materially increased. It is also furnished with a time attachment. The Marvel regulator has been found to be especially serviceable in connection with district steam control.



"MARVEL" TEMPERATURE REGULATOR INSTALLED.

ECLIPSE STEAM SPECIALTIES, comprising the Hughson line, formerly made by the John Davis Co., are featured in a new "pony" catalogue, issued by the Illinois Engineering Co., Chicago, Ill. This line includes reducing valves, automatic stop and check valves, back pressure valves, exhaust relief valves, separators, steam traps, balance float valves and low water alarms. The company announces that it has doubled the capacity of both its factory and bronze foundry and has retained the old skilled mechanics, assemblers and testers of the John Davis Co. Size 3½x6 in. Pp. 16.

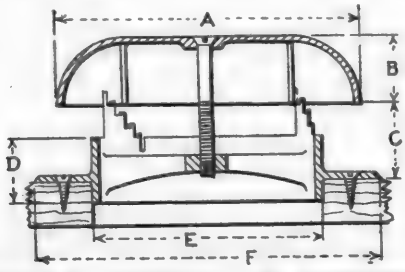
JA-NAR, an automatic device in the shape of a radiator covering for maintaining uniform room temperatures, is treated in an interesting catalogue received from the Fulton Co., Knoxville, Tenn. This device was formerly handled by the Annex Co., which was a subsidiary of the Fulton Co., but the Annex Co. has now been absorbed by the Fulton Co. The Ja-Nar is described as the only device which can be installed on one or more radiators, on new work or old, and one which works automatically, furnishing its own operative power without the use of compressed air, batteries, clocks, motors or other outside means. It is an insulated covering, made of furniture steel, which fits over the radiator. It has a grille, back of which are located louvres which are opened or closed automatically by a Sylphon regulator. The regulator is exposed to the room air and the louvres serve to increase or decrease the heat output of the radiator, depending on the needs of the room. The Fulton Co. is the inventor of the well-known Sylphon regulator, which is widely used in heating work in controlling the temperature of hot water boilers and tanks and for operating the draft dampers of house heating boilers and furnaces. Included in the catalogue are charts showing the temperatures obtained in a typical residence before and after the Ja-Nar was installed. Without control the inside temperature varied from 72° to 81°, while after the Ja-Nar de-



JA-NAR RADIATOR COVERING.

vices were in operation, there was a variation of only 1° above and below the temperature at which the Ja-Nar was set. The point is emphasized that it is not necessary to increase the radiation when installing Ja-Nars. Detail drawings are included illustrating the application of the device for different sizes and positions of radiators. Size 7x10¼ in. Pp. 20.

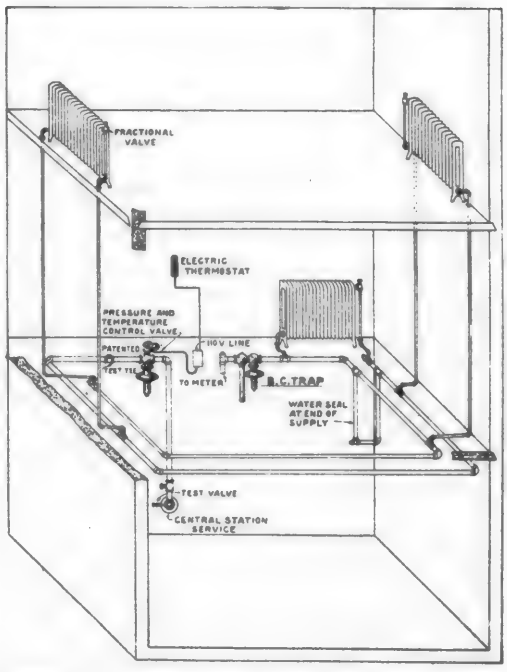
VENTILATION THROUGH DISTRIBUTION is the title of the latest catalogue devoted to the Knowles mushroom fresh air diffusers for use with heating, cooling and ventilating systems for theaters, churches, schools, auditoriums and public buildings. They are manufactured by the Knowles Mushroom Ventilator Co., New York. In the new catalogue working drawings are presented of the various types of this device, the place of honor being given to the Knowles "Notch" air diffuser, patented June 30, 1916, which is made with set adjustments in the notches. Adjustments are made by loosening the screw, raising the hood to the desired opening corresponding with the notches on the floor piece, of which there are four, and then tightening the screw. The device is made "fool-proof" by the lock screw. It is made with either flat screw eye lugs for wood floor construction, or with drop L shape lugs extending down from the floor flange to secure the head in the



KNOWLES "NOTCH" AIR DIFFUSER.

cement finish of a concrete floor. It can also be supplied without lugs, but with three ⅛-in. holes drilled in the bottom shank for the purpose of riveting thimbles to the device. The other types includes the "single damper," "double damper," "lever lock," "bottom damper" and "no regulation" heads. The catalogue concludes with an important list of buildings in which the Knowles air diffusers are installed. Size 3¾x8¾ in. Pp. 16.

HORNUNG PRESSURE AND TEMPERATURE CONTROL VALVE is featured in new circular matter received from J. C. Hornung, Chicago, Ill., engineer for central station and industrial heating and lighting. The Hornung pressure and temperature control valve is supplied with an electric thermostat for controlling the temperature in residences, stores and other buildings heated from central stations. The



TYPICAL INSTALLATION OF HORNUNG PRESSURE AND TEMPERATURE CONTROL VALVE.

lowest steam pressure necessary to fill the radiator and no steam in the piping system when no heat is required are given as the combined functions of this valve. Special attention is called to the fact that usually in shutting off radiators the piping is not necessarily shut off, so that there is a definite economy possible through the use of this valve. This device is supplied in two styles and the various dimensions, etc., are included in the circular. Motors are furnished regularly for 110 volts, either A. C. or D. C.

FOXBORO THERMOMETERS, indicating and recording, are the subject of a new catalogue (Bulletin No. 104), recently issued by The Foxboro Co., Foxboro, Mass. The thermometers described are grouped in four classes: Classes 1 and 4 for temperatures from 60° F. to 250° F.; Class 2 for temperatures from 50° to 400° F.; and Class 3, for temperatures up to 900° F. The bulletin describes at length the actuating principles and the many improvements which have been embodied in the Foxboro design. Special pains have been taken in the arrangement of the catalogue to make it as easy as possible for a prospective customer to pick out a thermometer to meet his requirements. An information form is included to be filled out when making inquiries or sending orders and carefully-written directions are given for compiling the necessary data. Size 8x10½ in. (standard). Punched for binding. Pp. 56.

STAR SAFETY WATER TUBE BOILERS, for steam heating, hot water heating and power plants, down-draft type, are illustrated and described in a new catalogue issued by the Harrisburg Star Boiler Co., 2 East 23rd St., New York., general selling agents for the Harrisburg Mfg. & Boiler Co., Harrisburg, Pa. These boilers, it is pointed out, are designed to comply with all smoke ordinances and the laws of Massachusetts, Ohio and the cities of Detroit and Philadelphia, and also with the A. S. M. E. code. One of the principal advantages mentioned for the boiler is its ability to burn bituminous coal without offensive smoke. In this connection, a supplement to the catalogue gives the result of a test made with a Harrisburg Star boiler standing uncovered in the open air and burning two kinds of bituminous coal. The test figures which are given in detail show a smoke elimination in the two tests of 96% and 91%. Size 9 x 6 in. Pp. 32.

STAR SAFETY WATER TUBE BOILER.

FARNSWORTH TRAPS, made by the Farnsworth Mfg. Co., Boston, Mass., are the subject of a blanket folder, featuring the company's line of duplex boiler feeder traps, non-return separating traps, lifting traps, meter traps, condenser vacuum traps and vacuum traps. All of these are shown in a typical installation and their various uses described at length. Views are also included of the Southern Building, Washington, D. C., showing the duplex boiler feeder installed and the motor-driven vacuum pumps with two 15-H.P. motors which it displaced.

VULCAN SOOT CLEANERS for both water-tube and fire-tube boilers, in which use is made of powerful steam jets directed along diagonal paths at about 60° to the horizontal, are discussed in a new engineering catalogue issued by the Vulcan Soot Cleaner Co., Du Bois, Pa. The catalogue takes up soot formation, the effect of soot on efficiency, what soot really is, etc. Size 6 x 9 in. (standard). Pp. 91.

C & C ELECTRIC MOTORS, TYPE SL, are the subject of a new bulletin (No. 101) published by the C & C Electric & Mfg. Co., Garwood, N. J. This bulletin presents the company's well-known line of direct-current motors, which are of the four-pole interpole type, built in sizes from 1 to 125 H.P. The bulletin is well illustrated and describes the details of construction of the parts and contains a complete table of adjustable and constant speed ratings, with full dimensions of all frames. Size 8 x 10½ in. Pp. 20.

TIRRILL "EQUALIZING" GAS MACHINE, for making gas automatically as wanted and for furnishing a steady supply of dependable gas of a standard, uniform quality for cooking, lighting, heating, power and industrial purposes, is the subject of a catalogue devoted to this device, which is manufactured by the Tirrill Gas Machine Lighting Co., 103 Park Ave., New York. It consists of an air pump or meter, operated by a suspended weight; the gas generator buried in the ground outside of the building to contain the gasoline, and the mixer, which is also buried in the ground near the generator. This device takes the gasoline vapor from the generator and mixes it with a given quantity of air. Size 3¾ x 8¾ in. Pp. 16.

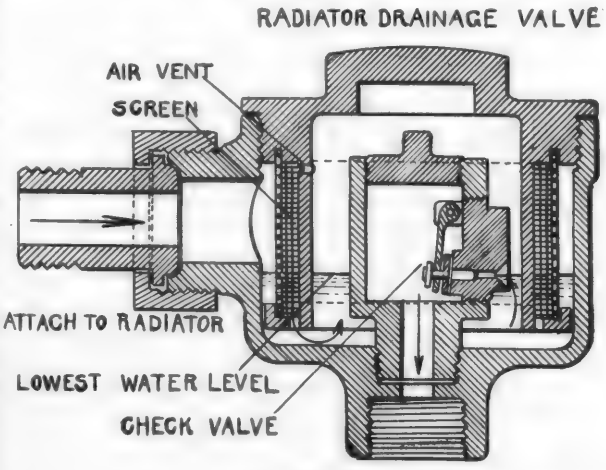
OIL FILTERS is the title of a new bulletin (No. 5) recently issued by the Richardson-Phoenix Co., Milwaukee, Wis., describing that company's complete line of filters for purifying lubricating oil, having capacities of from 25 gals. to 50,000 gals. per hour. Size 8½ x 11 in. (standard). Pp. 24.

VALVE WORLD, for July, 1916, the monthly periodical of Crane Co., Chicago, discusses cast iron, in the series of non-technical chats on "Iron and Steel and Their Applications to Modern Industry," written by L. W. Spring, the company's chief chemist

and metallurgist. The article is profusely illustrated.

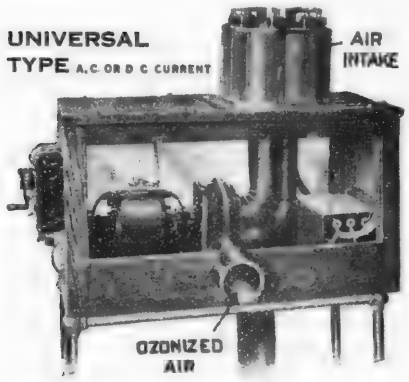
HOUGHTON THERM SYSTEM OF STEAM CIRCULATION is the subject of a revised catalogue (Bulletin A) published by E. F. Houghton & Co., Philadelphia, Pa. The principal feature of this system is the Houghton Therm valve placed at the return end of each heating unit and at the drip point of supply mains, to automatically permit the passage of air and water of condensation and to prevent the escape of steam. This valve is constructed on the thermostatic principle. Its actuating mechanism is the well-known Marck tube, which is made of selected material, hollow, bent crescent-shape, and capable of withstanding great pressure. It is filled with a liquid which becomes a gas at 212° F. The vaporizing of this liquid, when steam comes in contact with it, serves to expand the tube, thus closing the valve. Other appliances used with this system include the Houghton combined float and grease trap, to take care of the entrained oil in the exhaust steam intended for the heating system; the Houghton steam pressure reducing valve; the Houghton suction strainer and condenser head, to prevent scale and dirt from being carried into the pump from the heating system; and the Houghton vacuum pump controlling valve, to maintain the vacuum at the predetermined point. This valve is attached to the vacuum pump which discharges the air and water of condensation to an air-separating tank, from which the water passes through a discharge pipe to a feed water or to a pump and receiver, the air escaping to the atmosphere through a vent in the tank. The catalogue includes a complete layout showing the use of all of these devices and additional illustrations are given of details of piping connections with this system. Size 6 x 9 in. (standard), punched for binding. Pp. 32.

PECK SYSTEM OF DIFFERENTIAL PRESSURE STEAM HEATING is the subject of an interesting discussion published in circular form by Cassius C. Peck., Rochester, N. Y., the designer of this system. In its simplest expression, says the circular, this is a system of blowing through a heating circuit from a boiler to the atmosphere. When the heating system is in operation, this blowing through all radiators in use and that are filled with steam or vapor is continuous, but in case of radiators which are only partially filled with steam there is a balance of pressure and only water of condensation escapes into the return pipe. Near the return end of the heating circuit a vent pipe is provided to conduct steam and air from the return pipe through a condensing coil, or radiator, proportioned to condense all steam, the remaining air being delivered to the atmosphere. A device at the end of the vent pipe is included to prevent escape of steam and also to prevent the entrance of air into the system when the steam pressure in the boiler and in the heating circuit falls below atmospheric pressure. The trap for draining supply pipes and large radiators, as well as the radiator drainage valve used with this system, are illustrated in the circular. One of the interesting statements made is that the greatest advance in steam heating has come through maintaining lower pressure in the water return pipes than in the radiators, as this, it is stated, determined a suction effect which tends to draw water and air from radiators, this tendency being controlled by automatic valves which prevent excessive discharge. Under this condition the amount of steam in each radiator can be fully controlled by the supply valve.



THE PECK AUTOMATIC DRAINAGE VALVE.

OZONE APPARATUS, formerly manufactured by the Ozone Machinery Co. of America and now handled by S. G. Hunter, 117 Twenty-second street, Des Moines, Ia., sole owner of the patent, is the subject of an interesting treatise on the air of towns, also calling attention to various types of ozone apparatus. These include the household type for alternating current only; the residence and office type, for either alternating or direct current, with capacities from 3,600 to 7,500 cu. ft. ozonized air per hour; and the universal type, alternating or direct current, built in eleven sizes, from 4 to 48 units, and with capacities from 50,000 to 700,000 cu. ft. of ozonized air per hour. Size 3½x6 in. (standard). Pp. 16.



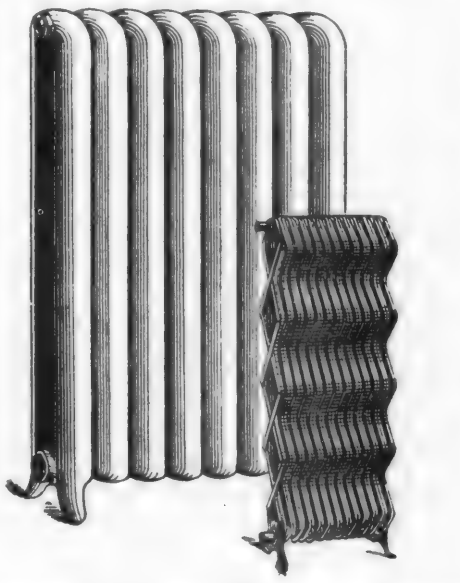
UNIVERSAL TYPE OZONE MACHINE, A.C. OR D.C. CURRENT.

Instruments for recording carbon dioxide in flue gases, by J. F. Barkley and S. B. Flagg, is the title of a new bulletin (No. 91) published by the Bureau of Mines, Washington, D. C., It contains 60 pages, with 25 illustrations.

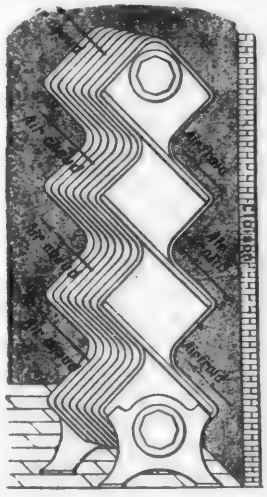
New Type of Direct Radiator.

A new form of construction for a radiator, designed to give a greater heating capacity for the same amount of surface, has been brought out in France by Charles-Elie Cabanes, 5, Rue Laffitte, Paris. We are indebted to Julien Champeaux, general manager of the company, 24, Westbere Road, West Hampstead, London, N. W., England, for the accompanying facts concerning this radiator. It is known as the Ardent and is designed especially to bring the cool air to the top as well as to the bottom of the radiator. In the ordinary type it is well known that the top of the radiator does not have as high an efficiency as the lower part, owing to the greater temperature difference between the air and the radiator at the bottom.

In the Ardent radiator construction the air is made to pass obliquely through the radiator through the use of partitions dividing the radiator into sections. In this way



"ARDENT" RADIATOR COMPARED WITH ORDINARY TYPE OF DIRECT RADIATOR.



COURSE OF AIR THROUGH "ARDENT" RADIATOR.

the air as it impinges on the sections will be practically as cool at the top as at the bottom.

Besides being more effective, the advantages claimed for these radiators are that they are less cumbersome, are easier to transport and are savers of fuel. They are stated to be especially effective in the case of hot water heating, the claim being made that they increase the water circulation three times over what it is in the ordinary radiator, under similar conditions.

The Ardent is made in various heights and sections with from one to six partitions. It is made of cast iron, but it is also made of aluminum.

New Boiler Wall Coating.

Engineers who have had trouble in getting perfect fuel combustion will be interested in the new boiler wall coating, known as J-M Aertite, which has been placed on the market by the H. W. Johns-Manville

Co., New York. This coating is designed to prevent air infiltration which has been a prolific source of imperfect combustion. The J-M Aertite boiler wall coating provides a tough, rubbery coating or blanket over the entire boiler setting which remains tight due to its adhesive and ductile qualities. It is applied by troweling on the outside of the boiler wall, and it is stated that the best results are obtained by keeping the thickness as near 1/16 in. as possible. When applied at this thickness, it is estimated that 25 to 40 lbs. of the coating will serve per 100 sq. ft. In a recent test of this coating, made at one of the largest power plants in New York, the results before and after J-M Aertite coating was applied showed that the amount of CO_2 was increased 2¼% after the gases had passed the first baffle, and 16.4% after the gases had passed the second baffle.

Washed Recirculated Air Compares Favorably With Fresh Air.

Continued experiments with washed, recirculated air and with fresh outdoor air in one of the Bronx, New York, schools indicate that as good progress is made by children subjected to partly recirculated air as by those provided with a liberal supply of outside air. The rate of improvement recorded by both groups is decisive, but the advantage is with the children supplied with washed, recirculated air.

The experiment was conducted under the auspices of the New York State Commission on Ventilation at Public School 51, Bronx, and covered two classes for two terms, Professors Edward L. Thorndike and G. J. Rugers of the Teachers' College being in charge.

Tests were given the children in addition, cancelin numbers, canceling letters and finding and copying addresses and the results in both experiments showed an advantage in favor of the recirculated air group over the fresh air group. In the first experiment the recirculated air group gained 298.8, and the fresh air group 192.2. In the second experiment the relative figures were 191.2 and 184.8.

Accounting Systems for Manufacturers and Retail Merchants.

Two booklets are being sent out by the Federal Trade Commission to merchants and manufacturers throughout the United States, one dealing with the fundamentals of a cost system for manufacturers and the other outlining a simple system of accounts for retail merchants. They have been prepared with much care and are simple and to the point.

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TRADE AND MISCELLANEOUS NOTES

Coming Events.

October 24-27, 1916.—Annual meeting of the American Public Health Association, in Cincinnati, O. Secretary, Selskar M. Gunn, 755 Boylston street, Boston, Mass.

December 5-8, 1916.—Annual meeting of The American Society of Mechanical Engineers, in New York. Headquarters at the Engineering Societies Building, 29 West 39th street.

Miscellaneous Notes.

Baltimore & Ohio Railroad Company's tunnels in West Virginia between Clarksburg and Parkersburg, including those at Eaton, West Union, Silver Run and Ocean, have been equipped with new ventilating systems costing $70,000. The new systems, which are now in operation, consist of large fans propelled by steam power and located near the portals. The water supply necessary for purifying the air was secured by digging well to a depth below the point of pollution.

Houghton, Mich.—According to Dr. John W. Plant, of Syracuse, N. Y., a tuberculosis specialist and an expert on ventilation, out of twenty counties visited in Michigan, he found only one properly-ventilated high school building, which is that in Holland. He says that, for the most part, the ventilating systems in use in the schools of Michigon are "poor, inadequate, almost criminal." The principal fault he finds with them is that they will not permit the opening of windows. In his report he recommends the use of muslin screens as the best way to ventilate with open windows. In connection with moistening the air he instanced the practice in one case where open hogsheads of water were placed in the chamber in which the air was being heated. The evaporation from these barrels, it was found, was about 10 gals. per week, while, he said, it should have been

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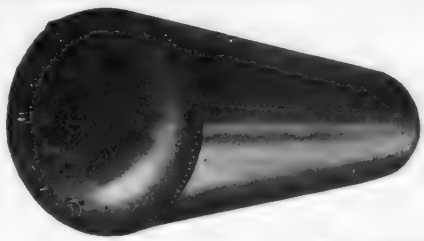

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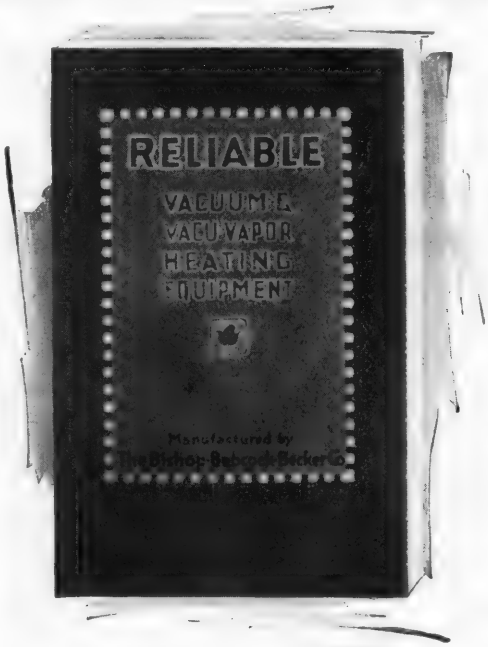
100 gals. per day. He urges the provision of an open-air school room for every school.

Kansas City, Mo.—In a naive letter to the Kansas City Star, a correspondent asks: Can you tell me about that cut through the hill southeast of the station? I noticed street car tracks through it, but a native told me the rails were there only for dump cars used in removing the earth, and as far as he knew the purpose in digging through the mountain was to allow fresh air to reach the station. The retail district also got better ventilation, he pointed out. He said the rusty rails would be removed as soon as the walls of the cut were trimmed and plastered. What did this adjunct to municipal ventilation cost? When will it be entirely finished? Will it be filled with snow in winter or will the warm southern zephyrs keep it at a moderate temperature and thaw the snow?

Chicago, Ill.—According to the Chicago Tribune, several hundred people in Chicago's loop district never felt the recent hot waves. While ordinary office men and women sweltered in the small rooms as high as the twenty-first floors and tried vainly to fan themselves into comparative comforts, this colony went about their business just as usual. Sometimes they were entirely too cool to be comfortable. The temperature on the street might be 102 in the shade, but often these workers found it as low as 65° in their quarters. Facts of this nature were brought to light by a statement issued by Health Commissioner Robertson. He called public attention to the cool air circulating through the sixty miles of tunnels under the loop and in many buildings pumped through boiler rooms, engine rooms and freight packing rooms of the basements, sub-basements and sub-sub-basements. Dr. Robertson asked the ventilation engineers to suggest a practical means of cooling all the rooms in all the big buildings by pumping this air through them.

Asheville, N. C.—A plan is being considered to move the present heating plant at the city hall to Aston Park, for heating the water in the swimming pool in the park. In that case a new plant will be installed in the city hall.

Boston Master Steam Fitters held their annual outing July 20 at Nantasket, Mass. Frank W. Howard, of the Ingalls-Kendricken Co., Boston, presided at the busi-



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ness meeting. The matter of a permanent secretary for the association was taken up, but no definite action was taken. It is expected, however, that a permanent secretary will be appointed soon. William H. Oakes, of the Buerkel Co., Boston, delivered an address on "The Value of Organization." Luncheon was served at the Pemberton Inn.

Chicago Master Steam Fitters' Association has elected the following additional members: J. H. Olson, 4012 South State street, and August Bartels, 1216 St. Charles street, Maywood, Ill.

National Association of Master Plumbers will be under the management of the following board of directors, which has recently been appointed by President D. H. Roberts: James S. Cassedy, 700 Massachusetts avenue, Cambridge, Mass.; John Trainor, 877 North Howard street, Baltimore, Md.; E. D. Hornbrook, 1116 Oak street, Kansas City, Mo.; A. C. Eynon, 236 North Walnut street, Canton, O.; A. Selden Walker, 341 Main street, East Orange, N. J.; Henry Green, 77 West South Temple street, Salt Lake City, Utah; William F. Eckart, 1614 Third avenue, Seattle, Wash.; W. S. Loftis, 2 Cone street, Atlanta, Ga.; John L. Robertson, Mason City, Ill.; Frank B. Lasette, 238 West 108th street, New York City; Alexander Coleman, 706 Ellis street, San Francisco, Cal.

President David H. Roberts, Cleveland, O.; Vice-President L. McNamara, St. Louis, Mo.; Secretary Eb Ellen, Cleveland, O., and Treasurer William McCoach, of Philadelphia, will also serve on the board of directors, ex-officio.

Building Operations for July, 1916, omitting the figures for New York City, show a slight gain over the corresponding period a year ago. In New York City, the total reached $49,205,220 as compared with $4,845,303. This tremendous gain, however, was due to the adoption of new building regulations effective July 25, limiting the heights of buildings. Chicago, with figures of $8,076,800, showed a 25% increase. Other cities reporting increases were: Cleveland, 46%, Detroit, 73%, the figures being $4,622,590; Milwaukee, 144%; Minneapolis, 30%; Seattle, 251%, and St. Louis, 151%. Cities reporting decreases included Baltimore, 11%; Boston, 10%, Cincinnati, 38%, and Philadelphia, 15%.

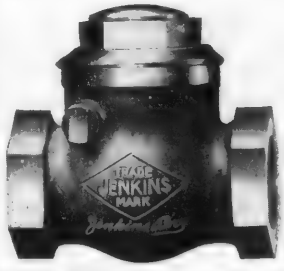
American Foundrymen's Association held its annual meeting in Cleveland, O., September 11-15. Headquarters were at the Hotel Statler. The programme included 40 papers and eleven committee reports.

Central Station Heating Notes.

South Bend, Ind.—The work of carrying the steam heating pipe line of the St. Joseph Heating Company across the St. Joseph River is nearly completed. An unusual number of engineering problems arose in connection with this work. The mains are 18 in. in diameter and are encased in insulation jackets 32 in. in diam-

Jenkins Bros. Swing Check Valves

IMPROVED GLOBE SHAPED PATTERN



The design provides a strong, handsome and durable valve. Fitted with renewable Jenkins Disc. The disc is of softer and more flexible composition than the metal and not only assures a tight seat adapting itself to any slight unevenness of the seating surface, but also fully protects the seat from injury due to severe pounding. Valves can be installed in either horizontal or vertical position.

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eter. Because of the cramped space in which the men were compelled to work, the use of tackles or jacks was out of the question and the heavy pipes were lifted by hand. Some sections weighed as much as four tons. As finally slung into position, the pipe is carried on steel hangers and the whole is encased in a wooden box filled with sawdust. This acts as additional insulation. At regular intervals expansion sections have been inserted.

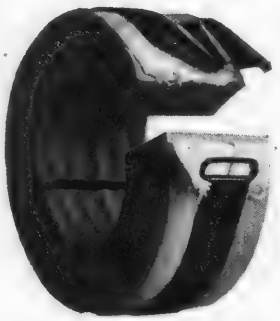
Saginaw, Mich.—A check for $233.14, representing 2% of the annual gross receipts of the Consumers' Power Company, has been paid to the city of Saginaw, the ordinance under which the company is operating calling for such a percentage "derived from the sale of steam for heating or other purposes." The annual gross receipts for the year ending June 30, 1916, were $11,656.78.

Sibley, Ia.—The Sibley Heating Co. composed of citizens and business men of that city, has begun the erection of a central steam heating plant, to cost $22,000. The contractors are: Messrs. Bain of Milwaukee and Robb, of Minneapolis. With a view of having as many buildings as possible connected and ready to use heat early in the Fall, local heating men are preparing estimates and rushing material for property owners. To meet the outlay for the plant, notes or bonds in denominations of $50 and $100 are being issued, secured by a first mortgage on all the property of the company. The total issue will not exceed $10,000 and interest will be at the rate of 7% per annum. The bonds will run ten years. The remainder of the cost will be met by an issue of capital stock. All income from the plant will be used for the repayment of capital stock and bonds. H. E. Scott is treasurer of the company.

Onawa, Ia.—The civic committee of the Booster Club, composed of Attorney Geo. E. Allen, Mayor C. F. Nord, City Clerk Charles L. Collins, E. D. Corr and W. H. Wonder, is agitating the question of a central heating plant for Onawa. The committee recently investigated the plant at Ida Grove and, it is reported, were favorably impressed with the proposition.

Bristol, Conn.—An increase in the price of steam heat has been announced by the Bristol and Plainville Tramway Co., which operates the city heating plant at Highland Court. Beginning October 1, the rate will be 90 cents per 1,000 lbs. of condensation, with a discount of 25% for payment within fifteen days after the date of the monthly bills. The former rate of 70 cents per 1,000 lbs. of condensation in excess

We Sell Insulation—Insulation That Meets Your Particular Requirements and Gives Maximum Results at a Minimum Cost



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They are finished with the definite purpose that they shall harmonize with the most beautiful surroundings, and retain that appearance always. The large, easy-turning handle has a beautiful mahogany finish. This handle will not crack or split, and as a further precaution in keeping it cool there are ventilating holes in the handle follower.

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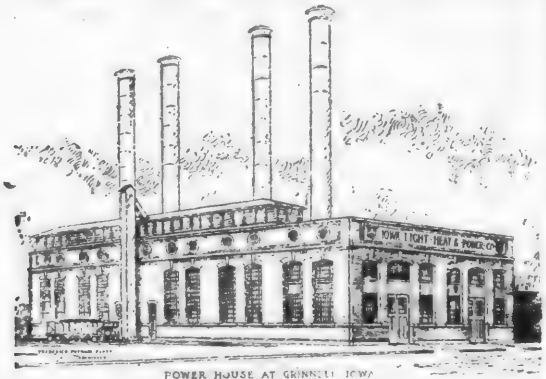
LARGEST MANUFACTURERS OF RADIATOR VALVES IN THE WORLD

Carried in stock in all sizes in all principal jobbing centers

of 10,000 lbs. has been withdrawn so that the new rate will have no discount other than that mentioned. This increase, it is stated, is made necessary by the embargoes on coal, the higher prices of fuel and extra costs for cartage from the railroad to the plant. The price of coal has increased 40 cents per ton. In the circular sent out to the company's customers, it was announced that the steam plant lost money last year. Last winter, when the price of coal began to rise, crude oil from the manufacture of gas at the gas plant was used for fuel, but after a time it was found to be unprofitable as well as inconvenient to cart the oil the long distance from the gas plant. The steam from the plant heats the business district and a large portion of the "hill" section. A few weeks ago the company lowered the rates on electric lighting, as the current from Falls Village was cheaper than the company could manufacture itself. Formerly both the steam and the current were made in the same plant, so that the steam was made at less expense, while now it is the principal product of the plant.

Grinnell, Ia.—Plans and specifications are now completed for the new power house of the Iowa Light, Heat and Power Co., at Grinnell. The plant will cost $100,000 and will be ready for operation early in 1917. The building will be of brick and steel construction. Four 300 h. p. boilers will be installed. The company has recently extended its electric current service to several points in Iowa, including Brooklyn, Malcolm, Kellogg and Newton, and has secured franchises for similar service in Lynville, Searsboro and Sully. Additional plants are being built, one in the Orange City district and one at Carroll, Ia. Paul Meyers is the company's manager, and R. A. Langworth is the engineer in charge of the new construction work.



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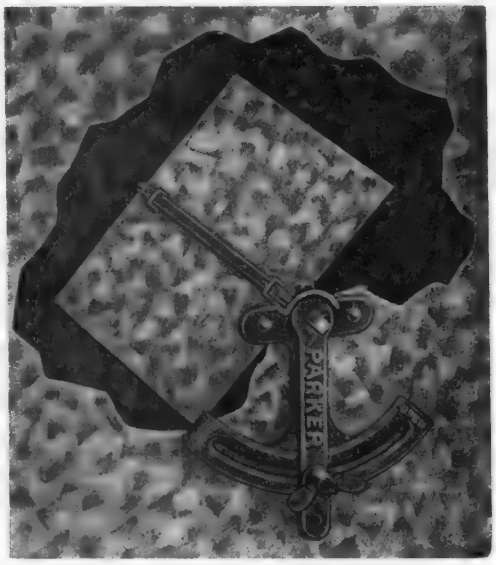

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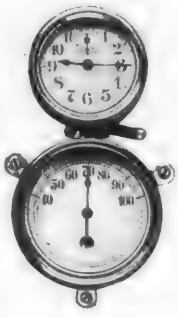

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Sturtevant Air Washer in No. 17 School, Rochester, New York. Sturtevant Heating and Ventilating Apparatus also installed. Architect, Edwin S. Gordon, Rochester; Engineer, A. S. Crocker, Rochester; Contractors, Wm. F. Devendorf & Co., Rochester.

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Bulletin 226-V or specifications on request.

B.F.STURTEVANT COMPANY

HYDE PARK, BOSTON MASSACHUSETTS

And All Principal Cities of the World

Rock Rapids, Ia.—A $25,000 public heating plant is being installed in Rock Rapids, Lyon County, to serve a lage section of this town which has a population of 2,500.

Anderson, Ind.—A deal has been consummated between the Central Heating Co., of Anderson, and E. M. Bendure, of Sedalia, Mo., representing the American District Steam Co., of North Tonowanda, N. Y., whereby the property of the Central Heating Co. has been leased to Mr. Bendure for a period of ten years. Mr. Bendure has been making a survey of the heating plant and the lease is a result of his survey. He assumes immediate charge of the plant, in place of O. P. Crim, who has been manager since the present company was formed four years ago. The present company succeeded former owners and a special franchise was secured from the city council, while a large amount of money was expended in erecting a new plant and installing new mains. The company was hard hit during the flood of 1912, which occurred shortly after the new plant had been completed. The plant was flooded and considerable damage done to the equipment. The plant and all property has

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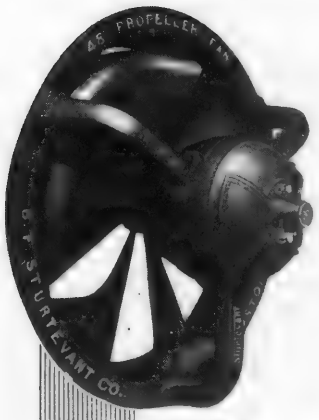

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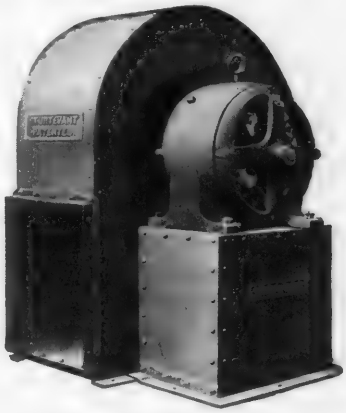

For more than half a century, we have devoted our time, our study and our vast resources to fans and their development. We have tried out the possibilities of every conceivable type and size.

Our engineers and our research department are continually testing, developing and improving, with the result that we are giving better fans and better service to our customers. This good service has created our business, making us the largest manufacturers of fans and fan systems in the world. In fact we build more fans than all our competitors combined. This is a distinction we have enjoyed ever since our establishment in 1866.

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been leased outright to the new management for a stipulated dividend on the preferred stock and other monetary arrangements. The new management is guaranteed a certain fixed sum for its service and is to be additionally reimbursed after a specific amount has been received by the stockholders of the present company. Mr. Bendure, the new manger, is enthusiastic over the prospects of the plant. There is an excellent system of mains, while the equipment of the plant itself is thoroughly modern. Another feature is the low price of steam heat which Anderson consumers have been enjoying.

Manufacturers' Notes.

Marshalltown, Ia.—The Lennox Furnace Co. of Marshalltown has secured an injunction in the district court at Des Moines restraining the Wrot Iron Heater Co., of that city, from manufacturing or selling a steel riveted furnace which is similar to the Lennox company's Torrid Zone steel furnace. The order restrains the Wrot Iron Heater Co. from duplicating the Lennox furnace and selling it as a duplicate, although the Lennox furnace is not a patented article. In his ruling Judge Dudley says that the defendants "produce a furnace in form and construction so exact that its parts are interchangeable with those of the Torrid Zone and does this in face of prior occupation of the field by plaintiff and so proceeds knowing that the public is, because of form and construction, likely to take one furnace for the other. This is practicing fraud both on public and plaintiff." The evidence showed that defendant had not only secured the services of former employees of the Lennox company to duplicate the Lennox furnace, but that he had used photographs of the Lennox furnace from which to make his advertising cuts and he had, by employing a clerk formerly employed in the Lennox company's office, secured a confidential list of plaintiff company's dealers and had approached them with offers to duplicate Lennox furnaces at cut prices.

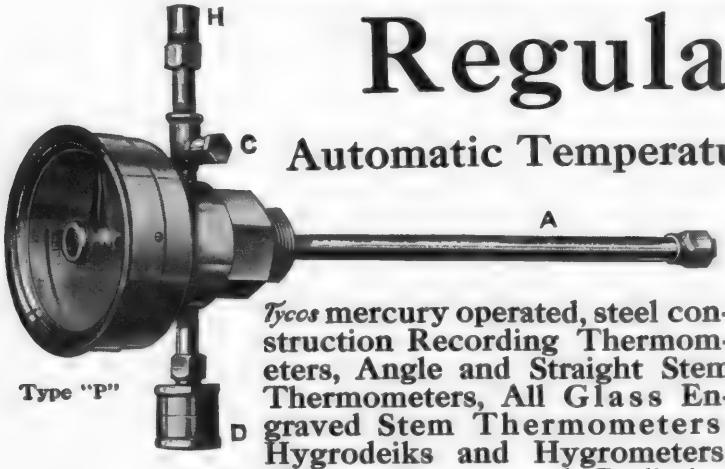
The Wrot Iron Heater Co. has been manufacturing a steel furnace of its own design and will not be affected as to this.

Newport Boiler Co., Chicago, Ill., has completed the equipment of its new offices and show rooms in the National City Bank Building, at 105 South Dearborn street, where two types of the Newport adjustable magazine feed boiler are on exhibition, fully assembled. Charles T. Newport, the designer of the boiler, and J. H. Newport are in charge.

H&M Thermometers

Regulators

Automatic Temperature and Pressure



Type "P"

Tycos mercury operated, steel construction Recording Thermometers, Angle and Straight Stem Thermometers, All Glass Engraved Stem Thermometers, Hygrodeiks and Hygrometers, Thermo-Electro and Radiation Pyrometers.

The *Tycos* Mercury Operated Recording Thermometer

Mark this: — Every Instrument bearing H & M *Tycos* makes honest claim to supremacy because every manufacturing step is carefully worked out in detail, applications carefully studied.

Put your problem up to us. Our experience will prove very valuable to you. Our service prompt and efficient, suggestions and literature free. Command us.

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THAT PROBLEM OF VENTILATING OLD BUILDINGS

which is often such a sticker for ventilating engineers, can be easily solved in most cases by Ventura Fans.

A Ventura Fan with motor attached can be set into the top sash of a window or transom. It does not take up any floor space, nor does it require any expensive construction. It will not be in the way of any of the machinery if the building is a factory, and it can be installed without seriously interrupting the operation of the factory.

Ventura Fans can be used either for exhausting or for blowing. As an exhauster, they are in special favor for removing fumes, steam and odors from varnishing rooms, dipping rooms, kitchens, laundries and garages. There are many cases in old factories where one or two rooms need extra ventilation. This is the place for a Ventura.

Some of the smaller Ventura Fans are reversible. Motor, direct engine drive, and belt drive are all accepted ways of propelling these fans.

Ventura Fans please purchasers because they furnish the required amount of air at the smallest cost for power and maintenance. The secret of their success lies in their extra blades, correct angle of air handling surfaces, and the large central disc which effectually prevents all back drafts.

Where heating as well as ventilating is required in old buildings, it is well to consider the Unit Heater (a portable heating and ventilating apparatus for small rooms or cold corners in larger rooms) and the Sirocco System (a flexible indirect heating system that is applicable to small as well as large buildings).

Send for Bulletins on these and other American Blower Products. The engineer with a thorough knowledge of American Blower Products can save his client money and add to his own reputation at the same time.

(18)

AMERICAN BLOWER COMPANY

DETROIT, MICHIGAN

BRANCHES EVERYWHERE

Bishop-Babcock-Becker Co., Cleveland, O., announces the appointment of Max P. Miller as manager of the company's vacuum heating department. Mr. Miller was for fourteen years manager and chief engineer of the heating department of Warren Webster & Co., of Camden, N. J., and for over two years was chief engineer for the Wyoming Engineering Construction Co., of Wilkes-Barre, Pa. The company's line of vacuum and vapor heating equipment include the Reliable vacuum pumps, VacUstat, Vacu-Trap and Vacu-Check thermostatic air valves, the Vacu-Graduate packless radiator valves and the "4-V" vacu-vapor vent valve. The Bishop-Babcock-Becker Co. has just opened another new branch in Dallas, Texas, at 915 Elm street. The company formerly maintained a Texas branch, so that its products are well known in that section.

Mead Gas Heater Co., Delawanna, N. J., manufacturer of gas water radiators, has appointed Paul Schaad as its sole sales agent in the greater New York district. Mr. Schaad's headquarters are at 110 John street.

Hinderer Bros. Co., Canton, O., which was recently incorporated with a capital stock of $20,000, to manufacture steam and hot water heating apparatus, is building a plant in Canton which will employ at the start 25 men.

New Incorporations.

James McWilliams & Co., Louisville, Ky., capital $12,000, to conduct a heating contracting business. Incorporators: James McWilliams, F. L. McWilliams and Kelly F. Miles.

A. J. Abels Co., Buffalo, N. Y., capital $10,000, to install factory heating and power plants, temperature controlling equipment, etc. Incorporators: R. R. Mitchell, M. B. Smith and A. J. Abels, all of Buffalo.

Root-Johnson Ventilating Co., Indianapolis, Ind., capital $10,000, to manufacture ventilators. Directors: William R. Root, Ralph C. Root and Maud G. Root.

Arnold Plumbing & Heating Co., Butte, Mont., capital $80,000, to conduct a general heating and plumbing business. Di-

ECONOMY PUMPS

A PUMP FOR EVERY PURPOSE

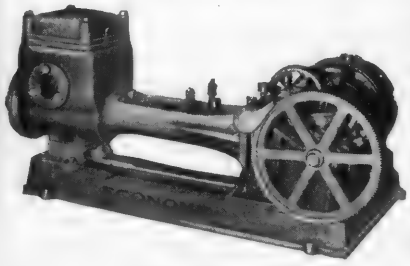

Figure 2149
Economy Motor Driven, Direct Acting Vacuum Pump, Double Acting Type

Automatic Bilge Pumps
Sewage Ejectors and Cellar Drainers
Automatic Condensation Pumps and Receivers
Vacuum Pumps, for two pipe or air line systems—automatic, electric or hand control
Automatic House Pumps and Compression Water Systems

ECONOMY PUMPING MACHINERY CO.
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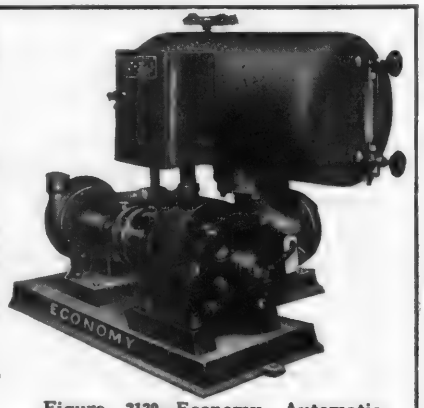

Figure 2129—Economy Automatic Condensation Pump and Receiver for low water lines and underground returns.

AIR CONDITIONING
never involves too complex a problem if you avail yourself of our advice.

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Engineering Corporation
39 Cortlandt St., New York
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Spencer Turbine Vacuum Cleaners
are manufactured in sizes from ¾ H. P. to 40 H. P.
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VACUUM CLEANERS EVERYWHERE

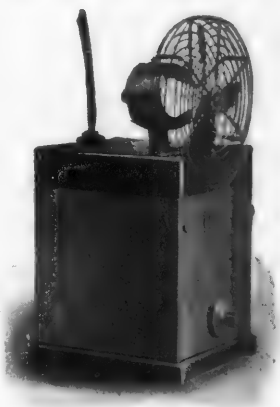
For installation in Residence, Apartment, School, Office Building, Sanitorium, Hotel, Factory, Church, Theatre, Hospital, Laundry, Library, Public Building, etc.

The Sanitary Way

Buy a "CONNERSVILLE" and Avoid Dust Dangers and Daily Drudgery

United Vacuum Appliance Co.
Connersville, Ind.

OZONATORS



Combination Ozonator and Electric Fan

A very successful apparatus for eliminating

Foul Odors

Low Cost of Operation

An aid to ventilation

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Of General Electric Company
Main Offices
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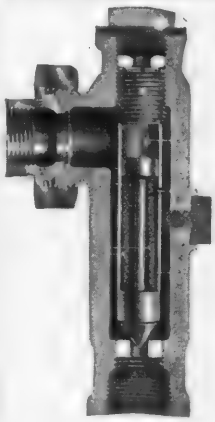
DO YOU KNOW THAT FOR COMPLETE AND LASTING SATISFACTION

YOU

SHOULD USE

RADIATOR



TRAP

SARCO

WHY?

BECAUSE its construction is different than that of any other type of trap, and has proven that liquid expansion and contraction is the most reliable form of motive power for any thermostatic radiator trap.

The Sarco has this liquid sealed in a chamber, the expansion operates on a spirally corrugated tube carrying the valve head. Steam coming in contact with this chamber of liquid immediately closes trap. Condensation opens it.

Send for detailed information and prices.

SARCO COMPANY, Inc.
Woolworth Building
Chicago New York Detroit

rectors: W. M. Arnold, O. C. Langstadt and N. Langstadt.

Kennedy-Cox Co., Gary, Ind., capital $10,000. Incorporators: Thomas F. Kennedy, M. K. Kennedy and Maurice J. Coy.

M. H. Baker & Co., Harrisburg, Pa., capital $5,000, to conduct a heating, plumbing and lighting business. Incorporators: M. H. Baker, L. M. Wagner and H. E. McClure.

Pittsburgh Automatic Heat Regulator Co., Pittsburgh, Pa., capital $50,000, to manufacture and sell automatic heat regulating devices. Incorporators: William Boyd, W. J. Holland and George W. Morgan.

E. Spindler Co., Eddyville, N. Y., capital $70,000, to conduct a realty, contracting and engineering business. Incorporators: I. Spindler, E. Braum and S. Lybolt, 604 72nd street, Brooklyn, N. Y.

Triangle Ventilation Co., New York, capital $50,000, to deal in ventilating and cooling machinery and devices. Incorporators: I. Reiner, H. G. Fink and E. Galinger, 27 William street.

Business Chances.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until September 12, 1916, for the alterations, etc., to the building adjacent to the United States Post Office in Brooklyn, N. Y. Drawings and specifications may be obtained from the supervising chief engineer, 727 Custom House Building, New York City.

Until September 19, 1916, for the construction of the United States Post Office at Warrenton, Va.

Until October 2, 1916, for the construction complete of the United States Post Office at Willows, Cal.

Until October 3, 1916, for the extension, remodeling, etc., of the U. S. Post Office and Court House at Huntington, W. Va.

Until October 5, 1916, for the construction of the U. S. Post Office at Berlin, N. H.

Until October 6, 1916, for the construction complete of the U. S. Post Office at Skowhegan, Me.

Contracts Awarded.

Healy Plumbing & Heating Co., St. Paul, Minn., heating, ventilating and plumbing new $200,000 school building in Grand Forks. This contract was awarded a year ago, but has been delayed by court proceedings. In view of the advance in the cost of materials, the company has declared its intention of instituting suit, when the contract is completed, to recover whatever losses may have been sustained by reason of the delay.

Gaylord & Eitapenc Co., Scranton, Pa., heating and ventilating Montrose School, in Susquehanna, for $4,983. Other bids were: Gaylord Engineering Co., $5,268; P. F. & M. T. Howley, $6,276; G. B. Carpenter, $5,-

Humidity at Low Cost

is obtained with the

SĀVŌ Air Moistener

Can be placed on the back of any radiator, out of sight and will supply the desired amount of moisture to any steam or hot water heated room. Especially adapted for houses, offices, schools and hospitals.

Specify them on your next job and save the cost of an expensive humidifying system.

Three sizes, $2.00, $1.75 and $1.00. Write for free illustrated booklet.

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Your Choice of Seven Types

is offered in our line of

Standard Recording Thermometers

We make a specialty of hot water and steam indicators

Send for Catalogue VH

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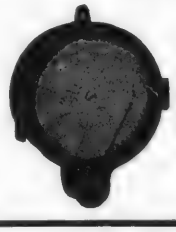

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BOOKS ON HEATING AND VENTILATION

DISTRICT HEATING. By S. Morgan Bushnell and Fred. B. Orr. This book not only imparts a general knowledge of district heating, but contains many points on economical operation, as illustrated in the methods practiced by central station heating companies which have been successful in this field. Comparative data are also presented indicating the prices that can reasonably be charged for heating service. Size 6 x 9 in. 300 pages. 81 figs. Cloth, $3.00.

CENTRAL STATION HEATING. By Byron T. Gifford. This work presents the most advanced practice in central station heating, both steam and hot water, and is an invaluable guide, not only to the engineer, but to municipalities and public service commissions where district heating is being, or will be, used. 208 pages, with 42 figures, including 50 pages of miscellaneous engineering data. Size 6x9½ in., bound in flexible leather. Price, $4.00.

VACUUM CLEANING SYSTEMS. By Maxwell S. Cooley. A reliable data book for engineers, architects, heating contractors and plumbers interested in the correct design and installation of mechanical cleaning plants. Size 6 x 9 in. 244 pages. 105 ills. 20 tables. Price, $3.00 postpaid.

VENTILATING DUCTS. By C. E. Pearce. A set of six tables printed on heavy Bristol board, for rapidly estimating the superficial area and weights of galvanized iron rectangular ducts used in ventilating work. Size 7 x 9 in. Price, 50 cents.

ELEMENTS OF HEATING AND VENTILATION. By Arthur M. Greene, Jr. A text book for technical students and a reference book for engineers. 330 pages. Size 6 x 9½ in. 223 ills. Price, $2 50 postpaid.

EVERREADY PIPE AND ELBOW CHART. By M. W. Pehl. An ingenious calculator made of celluloid for laying out and cutting all kinds of elbows, pipe and ventilation work. With 54-page book of instructions. Price, $1.00.

MECHANICS OF HEATING AND VENTILATING. By Konrad Meier. Including a series of ten charts containing data relating to the flow of water, steam and air, collected by Mr. Meier during an experience of 26 years in heating and ventilating work, both in this country and abroad. Each of the charts replaces a series of tables on the subject, giving at a glance the result of a calculation from any combination of factors. 161 pages, illustrated, with ten large charts. Size 6 x 9 in. Price, $5.00. Separate sets of charts, printed on cloth, with lines in different colors and mounted on boards. Single charts, $1.50. Sets of ten charts, $15.00.

HEATING AND VENTILATING BUILDINGS, a standard manual for heating engineers and architects. By Prof. R. C. Carpenter. Sixth edition, largely rewritten. 577 pages, 277 illustrations, 8vo, cloth, $3.50.

HANDBOOK FOR HEATING AND VENTILATING ENGINEERS. By Prof. James D. Hoffman and Benjamin F. Raber. The latest book on this subject. Unusually comprehensive. 320 pages, with 45-page appendix. Size 4½ x 6¾ in., bound in flexible leather. Price, $3.50.

PRACTICAL MANUAL OF STEAM AND HOT WATER HEATING. By E. R. Pierce. Especially useful to men engaged in installing steam and hot water heating apparatus. Easily understood and comprehensive. Boiler ratings exhaustively treated. 359 pages. Size 5½ x 8½ in. Cloth. $2.50.

QUESTIONS AND ANSWERS on the Practice and Theory of Steam and Hot-Water Heating. By R. M. Starbuck. Illustrated. $1.00.

PROGRESSIVE FURNACE HEATING. By Alfred G. King. A practical manual of designing, estimating and installing modern systems for heating and ventilating buildings with warm air. Written especially for contractors and mechanics. Size 6 x 9 in. 280 pages. 189 illustrations. Price, $2,50 postpaid.

PIPE FITTING CHARTS. By William G. Snow. A valuable reference work for the solution of knotty problems in connecting up steam radiators, boilers and the variety of appliances used in combination high and low pressure plants. 285 pages. 232 illustrations. Price, $2.00.

STEAM POWER PLANTS; Their Design and Construction. By Henry C. Meyer, Fr., M. E. Third edition, fully revised. One of the standard works on the design and construction of power plants. Covers proportioning boilers, selection and writing specifications for steam engines, selection and arrangement of auxiliaries, construction of chimneys, coal handling, etc. 219 pages. Size 6 x 9 in. Illustrated and with folding plates. Price, $2.00 postpaid.

DESIGNING HEATING AND VENTILATING SYSTEMS. By Charles A. Fuller. A textbook which treats both the theoretical and practical side of the subject in a simple, but clear and comprehensive manner. Instruction given covering the design any kind of heating or ventilating system. 224 pages. Size 6 x 9 in. 78 figs. and 37 tables. Cloth, $2.00.

PRACTICAL STEAM AND HOT WATER HEATING. By Alfred G. King. Containing over 300 detailed illustrations. The book is a working manual for heating contractors, journeymen steam fitters, architects and builders. Describes various systems of heating and ventilation and includes useful data and tables for estimating, installing and testing such systems. 8vo. 367 pages. Price, $3.00.

POWER, HEATING AND VENTILATION. By Charles L. Hubbard, BS., M.E. A treatise for designing and constructing engineers and architects. The whole subject of heating is covered, including the heating of large institutions with central plants. Space is also devoted to electrical matters connected with steam plants. 1015 pages. Vol. 1 (Steam Power Plants), $2.50; Vol. 2 (Heating and Ventilating Plants), $2.50; Vol. 3 (Combined Power and Heating Plants), $3.00. Sold separately.

NOTES ON HEATING AND VENTILATION. By John R. Allen. 152 pages. 34 illustrations. Size 4½ x 6½ in. One of the new books, brought quite up to date, and containing much information to guide the intelligent steam fitter in the installation and heating and ventilating apparatus. Cloth, $2.50.

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STEAM AND HOT WATER HEATING. By H. C. Lincoln. A new book giving an elementary knowledge of the principles of steam and hot water heating, together with their practical application to the design of complete systems. 160 pages, illustrations. Size 6x9 in. Price, $1.50.

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233; Wyoming Engineering Co., $5,497, and Gunster Bros., $6,671. The plumbing contract went to the Gaylord Engineering Co., at its bid of $1,990.

Powell & Dorste, Anderson, Ind., heating and electric wiring new hotel building in Anderson. Heating contract, $12,400; electric wiring, $3,514.

Van Dyck Plumbing and Heating Co., Des Moines, Ia., heating, plumbing and vacuum cleaning new high school building at Red Oak, for $16,205.

Peters-Eichler Heating Co., St. Louis, Mo., heating new Post-Dispatch Building, at Twelfth and Locust streets, for $50,000.

Seattle, Wash.—Bids were received as follows for the heating and ventilation of the proposed $70,000 addition to the Madrona School: Eckert Plumbing & Heating Co., $7,596; D. H. King, $7,295; J. A. Scherer, $7,941; McMahon Plumbing & Heating Co., $7,787; Nelson Plumbing & Heating Co., $7,450; Rautman Plumbing & Heating Co., $7,528, and Whipple & Co., $7,140.

Business Troubles.

Charles E. Evans, superintendent of the Evans Plumbing and Heating Co., Chicago, Ill., has filed a petition in bankruptcy, with liabilities of $94,920 and no assets. Twenty-three thousand dollars of the liabilities represent obligations due the United States Fidelity Guaranty Co. and the Lion Bonding and Surety Co. for surety on bonds.

Willard B. Graves, 211 North Jefferson street, Chicago, heating engineer, has filed a petition in bankruptcy, with liabilities of $11,309.52 and assets of $115.88.

WANTED.

Position Wanted.—Capable heating, ventilating and power plant engineer wants employment with architect, contractor or engineer. Excellent references given. Address Box 20, care of Heating and Ventilating Magazine.

BUSINESS OPPORTUNITY.

The President, who owns a controlling interest in a prosperous going concern in the heating line, wants to replace the present General Manager about January 1st next with a live, energetic, experienced man who can fill in a lot of vacant space with "pep."

The new man must have sufficient capital—about $25,000—to purchase the stock of the present manager. The position is a nice one and the right man can have a good salary. Address Longacker, care of Heating and Ventilating Magazine, 1123 Broadway, New York.

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AIR CONDITIONING APPARATUS

WEBSTER Air Washer and Air Conditioning Apparatus is constantly demonstrating its ability, under a wide variety of exacting conditions, to effect and maintain any desired temperature or humidity.

Whenever a highly efficient and thoroughly dependable air washing, air cooling or air conditioning system is required, WEBSTER Apparatus, by reason of its exclusive advantages, is selected by engineers, architects and owners.

No air conditioning problem is too difficult for us to solve. Our air conditioning engineering staff is second to none in existence. Give us the opportunity to prove this by taking up your next air conditioning problems with us.

We guarantee results in any problem we undertake.

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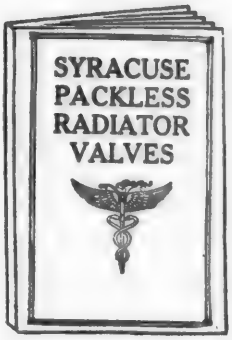
THREE NEW ONES



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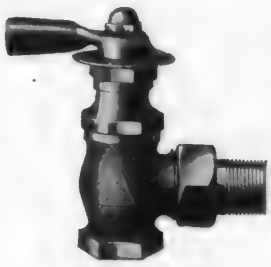
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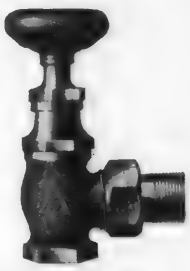
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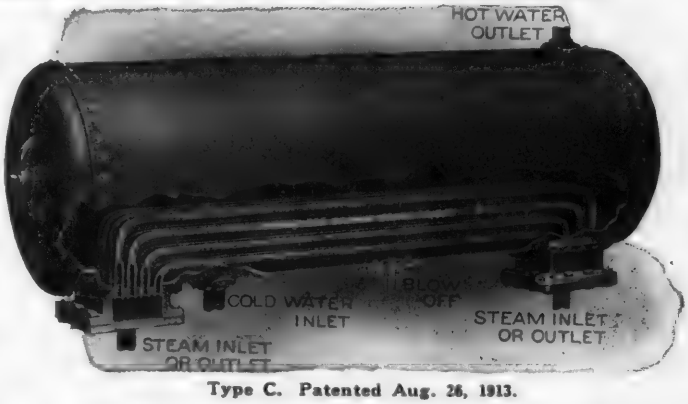
THE ⌐¬ SHAPE TUBES EXPLAIN THE SUCCESS of the

PATTERSON HOT WATER TANK

for heating water for domestic or manufacturing purposes. Both ends of each seamless brass tube are expanded into heavy cast-iron tube-heads with an improved roller expander. Their shape provides for the free contraction and expansion of each individual tube without straining, so there is no danger of leakage.



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Condenser-Lifting Trap

This Trap will efficiently handle condensation. Creates High Vacuum and pumps to any point of use.

More economical than pumps.—Coal saving guaranteed.—Investigate.

Used in conjunction with our Duplex Boiler Feeder, will show high economy over any other system, first cost and upkeep.

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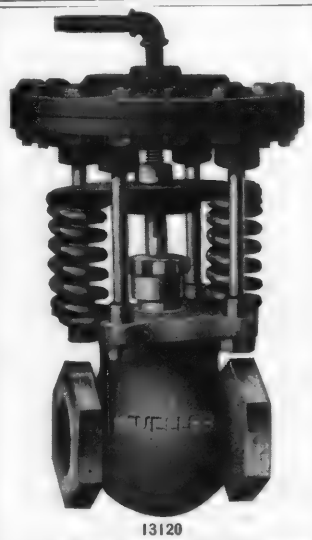

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in a reducing and regulating valve is dependent upon its being

The Right Kind
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The Best Service is always received with a valve marked

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The very safest way to be sure on these points is to consult our valve experts who will advise you without charge just what sort of a Mueller Valve will give you the greatest return for your money in service and satisfaction.

We guarantee Mueller Valves

when our engineers specify and recommend the installation; that's a very sure way of "knowing" just what to expect **before you spend a penny.**

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Sell Your Exhaust Steam for Heating

There's an ever-increasing demand for just this kind of public utility.

In progressive cities and towns in almost every state in the Union there are Electric Light and Power Companies that have installed the

AMERICAN DISTRICT STEAM HEATING SYSTEM

Business buildings, entire blocks, private residences and public institutions are availing themselves of this "money-saving" opportunity, and are being heated by live or exhaust steam delivered through underground mains from a central station.

Whatever size your plant—whether a large central station or a small lighting plant, you can dispose of your exhaust steam in this most profitable way.

The American District Steam Heating System is the best to install. Materials and plans are furnished and construction is superintended to the customers' meter.

Write today for our literature describing and illustrating this system.

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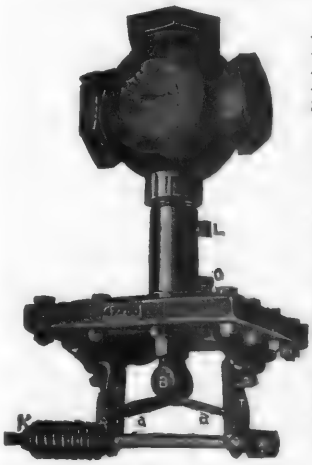
For Safety, Sureness of Operation and Durability

FOSTER PRESSURE REGULATORS

FOR STEAM HEATING SERVICE



(Classes "Q" and "Q H") lead the way. Designed especially for steam heating, and suitable for vacuum systems, for delivery pressure of from 1 to 15 lbs.

We make several types of pressure regulators—those shown in the illustrations here were designed particularly for steam heating service, and they are very sensitive, reliable, high grade in every particular and superior to other makes in construction and workmanship. There are no weights or close fitting pistons, and are easily adjusted to the desired pressure between 1 and 15 lbs. Made in sizes ¾ inch to 2 inches inclusive, composition body. Larger sizes are fitted with composition renewable seats.

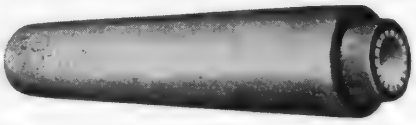
Class "Q" Class "Q H"

These Valves are fully explained on Pages 29 to 33 of our General Catalogue, No. 20.

FOSTER ENGINEERING CO., Newark, N. J.

CHICAGO, ILL., 180 North Dearborn Street
PITTSBURGH, PA., 518 Park Building
PHILADELPHIA, PA., 601 Harrison Building
BOSTON, MASS., 161 Summer Street

STANDARD
Steam Pipe Casing



For Insulating Underground Steam Pipe. Tin Lined, or Unlined.

Every salesman has his argument in order to sell the product he represents. Listen to our argument, be the judge, and you will find same not theoretical but practical, and from actual experience.

When you cover your steam line with our make of casing you have the assurance that the line will be constructed so that no heat will escape, and will be water tight as well, with ample space for air chamber.

Should occasion arise that it is necessary to get at the steam pipe, our covering CAN BE TAKEN APART WITHOUT DESTROYING THE STAVES in the sections of casing, and the same casing can be used again. LET US EXPLAIN HOW.

If your line runs in different branches we will build the casing in exact lengths so that you will not have to cut any sections, which means no waste or extra expense to you.

Our method of building covering will be to your interest. Our product is right, attention prompt, and prices low.

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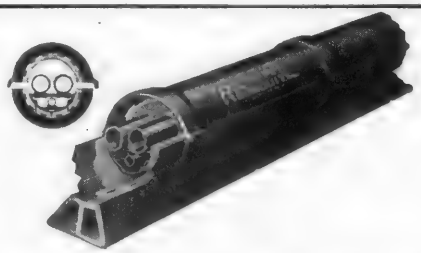
Standard Wood Pipe Co.
WILLIAMSPORT, PA.



Steam Conduit Troubles

are not merely curable—they are **preventable**—and the time for prevention is **when the specifications are written.**

Next to proper insulation, the one vital requirement of an underground heating system is efficient **underdrainage**—and this is assured by the **interlocking base drain,** an exclusive feature of the

RIC-WIL METHOD

This remarkably efficient base drain insures a dry ditch at all times, and is one of the important reasons for low cost of installing Ric-wiL systems—and for their permanency and remarkable freedom from repair cost.

Ask for full information to-day.

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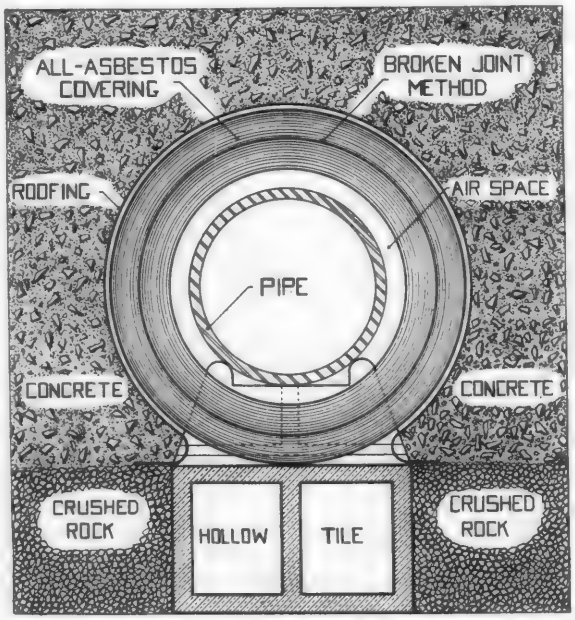

A type of Heating Mains with few specials—easily installed—permanent

INDESTRUCTIBLE
Conduit is made of CONCRETE and every LOCALITY "has the MAKIN'S"

Let me furnish you the covering, expansion joints, etc., together with complete specifications to meet your case.

Ask for quotations or estimates.

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ENGINEER
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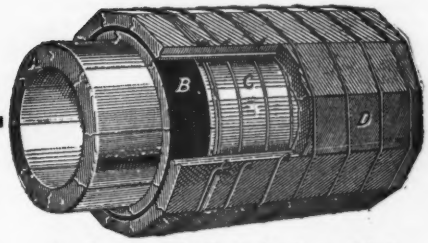

A—Inner Shell, 2 inches thick.
B—Asphaltum Packing.
C—Dead Air Space.
D—Outer Shell, 1 inch thick.

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WITH WYCKOFF'S IMPROVED

CYPRESS COVERING

Made of Gulf Cypress, the wood eternal

Not affected by wet and dry conditions common to steam-pipe trenches. Will not rot. Lasts twice as long as Pine Casing. Absolutely water and steam tight. Each shell is wound with heavy galvanized wire. Coated all over with the best known preservative—Hydrolene B.

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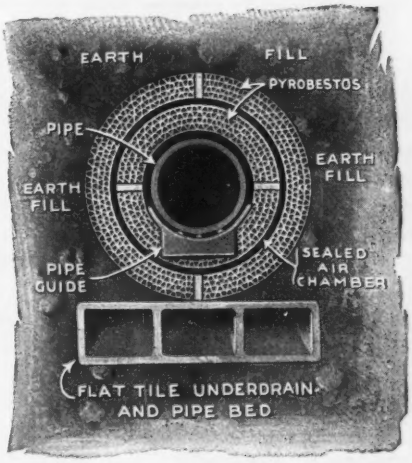

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SIMS CLEAN E-Z STEAM TUBE HEATER

For Hotels, Apartment Buildings, Hospitals, Y. M. C. A. Buildings, Schools, etc.

For Live or Exhaust Steam

requiring large quantities of hot water. This type of heater should be used in preference to circulating generator and storage tank—or instantaneous heaters.

Special attention given to all kinds of water heating problems based on long experience in this work.

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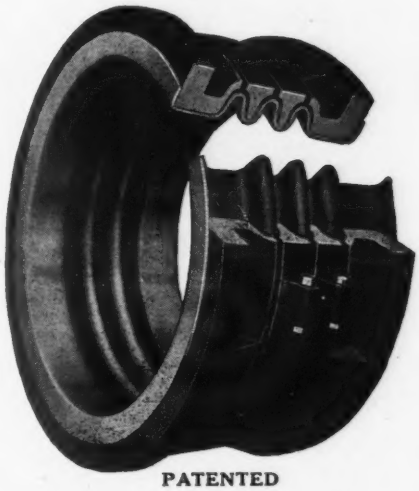

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